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REVIEW ARTICLE

# Globalized Economy and Energy Misconceptions

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## Abstract

The globalized economy conditions increasingly in volume and intensity, the exploitation of fossil-based energy and not only notably oil, natural gas and electricity.This causes impacts on the environment, in order to check a significant part of the efforts focused on the design, promotion and implementation of more sustainable models in terms of socioeconomic growth and development. The order of the overall system, as well as its economic, geopolitical and geo-strategic implication, impose misguided choices in terms of energy, and also restrictions on countries in possession of natural resources by setting intense models with respect to the exploitation thereof, as a result of the integration of developing countries in the process of globalized markets, in order to provoke consequences on the environment and development model of these countries with extremely adverse impacts in social and environmental terms.

**Keywords:** *Global Order, Energy Resources,Environment.*

## Introduction

In the context of the world system capitalist economy, it is registered the configuration of economic, productive and energetic models of a spendthrift, wasteful and irrational effect, fruit of a model defined by a subordinate of insertion in development within the scope of the world economy. This, in turn, manifests itself in the International Division of Labour (IDL), also referred to as International Division of Labour and Production (IDLP).

Effectively, IDL/IDLP, which involves asymmetries, under the industrial and technological point of view, outlines, so to speak, a screenplay about the role to perform, either by the nations of the developing subsystem or by organic-central countries of capitalismworld. If the to the latter, positions in production and technological terms would fit, to others, positions much more modest in terms of industrial and technological base apparatus are imputted.

While the organic-central countries focus on the preparation of goods with high technological complexity, the production of goods of limited level of technological incorporation is destined to the developing economies, and even though industrialized, raw, agricultural, mineral and energy materials.

## Energy and Global Economy

Developing countries show a structurally loss-making situation in terms of the balance of payments, the fruit of productive and technological constraints, of the high degree of inelasticity in imports especially from goods and services of technological nature, as is the case of capital goods. The structural deficit of the balance of payments of developing nations appears most clearly demonstrated in the situation of the balance of the balance of trade. Thereby, the structuralist analysis shows that there is a lag between the developing and the organic-central cities, regarding trade between them in the sphere of international trade. At the economic level, a high degree of industrial technological incorporation adds much more value than energy resources exported without any or reduced processing.

The rigidity arises either at the level of import (for example: machinery, equipment, processes, and engineering and technological and consulting services), or at the set of exports (to highlight: primary goods, several commodities - agricultural, livestock and minerals-, low value added processed goods, industrial products of low/middle level of sophistication and technological incorporation). In the Porcile and Cured [1] and Prebisch´s [2] wake, these imbalances (outstanding in trade balance) would be explained by unequal diffusion of technical progress at the global level, which leads to technological asymmetries between the countries and that translate for international competitiveness differentials.

Therefore, the organic-central countries of capitalism-world economies would show mature, integrated economies, the result of industrialization processes complete with capital and technology, while the peripheral countries/semiperipheral concentrate their activities in the primary sector or industrial segments (or semi-industrial) of low added value. On the other hand, as the income elasticity of industrialized products (machinery and equipment, for example) is much larger than those of primary commodities or low complexity industrialized, the terms of trade are always adverse for the developing economies.

The gap in competitiveness between the organic-central and peripheral/semipheral countries explains the increasing deterioration of external trade to the detriment of these last, fruit of varying degrees of technological productive complexity to characterize one and other of those distinct blocks.In fact, focus production in primary goods (including energy resources), in industrialized goods from low or medium degree of sophistication in its development and limited technological nature (processing of minerals or the transformation of energy-intensive goods but of low value added) much differs of the bet forefront goods, which constitute on the spearhead of innovation/technology.The difference is abysmal as the results of one to another category, with the smaller generating added value activities leading to intense energy consumptions and the perverse impacts on the environment, since the high value assumed by ratio «Energy/VAB» picking, often in maximizing «Energy/GDP» binomial, leads to less auspicious results in terms of «Energy/Environment» relationship.

## Energy and Subordinate Insertion

In the case of a number of developing countries, it is normal the resource from natural and energy resources as instrument of a process to modernize them. However, the adverse impacts at the level of enerby comsunption and (in) direct impacts on environment, many times more than cancel the apparent gains of ecnomic nature.From the point of view of an effective process of development, the industrial projects intensive in energy, in particular electricity, are intended for simultaneous utilization of abundant mineral and energy resource bases.

The most notorious example seems to be the case of the aluminum industry in Brazil that uses both large reserves of bauxite, as well as abundant water resources.The processing of bauxite into alumina and from this to aluminium requires a high electrical energy expenditure at levels incompatible with the costs of this source of energy in the organic world, in which water resources of great magnitude are sold out or close to exhaustion (case of United States of America and Europe) or are virtually non-existent (as in Japan) and most of the electrical energy of thermal origin with a Kwh significantly more expensive than that of hydraulic origin.

That type of initiatives forces the use of large volumes in terms of water resources, with impacts of socio-environmental point of view as in the construction of large dams and power plants, without due consideration in terms of industry and own development process. In fact, the production is restricted to alumina, aluminum bars on export to the organic-central countries, particularly for those of companies with a capital of those ventures, and certain consumer goods, and discarding any possibility of incorporating technology, replacement of import of goods with higher added value and technological progress. In this way, the high energy intensity of those projects are not considered compensated in terms of industrial production and gains from technological nature. Therefore, the generation of the value of these investments vis-à-vis the socio-economic, social-environmental, industrial and technological production returns. Soon, the energy-productive model of alumina/aluminum complex in Brazil constitutes a clear case of subordinate insertion in system-world capitalist economy.

## Gasthermal Option

When evoking certain authors [3-5], it is noted that the energy and economic use of the natural gas, is the same way as in the case of other fossil fuels, because of its character of non-renewable energy, implies major interests, heated disputes and conflicts, external environment lit of much more confrontation than cooperation at intergovernmental level.In fact, there is, at the level of the oil/gas scenerio, an external environment of a much more confrontational than inter-state level completion, since it is extremely difficult to convergence of interests between producers and consumers that lead to effectuation of geopolitical/geo-economic agreements, which worsens with the commoditization of natural gas, so as to follow the pattern of the financialisation of wealth. The commoditization of natural gas, in the context of the process of formation of a world market of this fuel, would be of interest of major international oil companies, once they would keep them in the process and so dominant.

With relation to financialisation of wealth, it should be noted that the liberalization of financial markets, which started in the United States of America in the mid-1980 and the deregulation of interest rates promoted by the Federal Reserve (FED) and its European counterparts, which was followed by the appreciation of the yen, led to major changes in capital and financial markets.In developing countries, economies face imbalances of the payments´ balances, already compromised by the oil shocks of the years 1970 and by the global recession, exacerbated by the increased international interest rates caused by the American hegemon.The absolute domain of financial logic imposes itself on the world economy, more distinct from the 80s, being driven by dollar hegemony. This marks the boundary of the development strategies, whose financing was based on the external indebtedness and the unquestionable victory of the liberal-conservative rematch, marking the triumph of neo-liberalism as dominant model.

With regard to the relationship between natural gas and thermoelectrical generation, Santos et al. [6] will be the ones to note that a segment of great relevance for the demand of natural gas, especially at organic-central contries, reragds to their use in thermoelectric power plants (electricity generation).

The natural gas thermoelectrical have a low cost of construction of the facilities compared to generating units that use other energy sources (coal, fuel oil, diesel oil, water and nuclear) and feature a significant generation of significant efficiency. As a result, it becomes feasible to establish long-term bilateral contracts between generators and consumers notably industry, particularly those of large companies.The thermoelectrical generation with natural gas use is relatively less pollutant than one from other fossil fuels and/or products (coal, diesel oil and fuel oil) and since the hydroelectric option presents clear advantages, namely: least term to return on investment, especially given the hydroelectric option; possibility of obtaining energy gains at the level of final uses, especially in endqintermediate uses, mainly in industry, and high potential, in terms of technological sophistication and difusion.

On the other hand, as advanced by Lima et al. [7], the mode of thermoelectrical generation with the use of natural gas shows still a number of points in its favor (small investment volumes, reduced construction period, possibility of construction of power plants next to the load centers, local jobs generating, encourage to investment in the region, small occupied areas, operational flexibility, etc.). In the case of a country on the basis of electric generation structurally/predominantly hydric, the thermoelectrics units by natural gas have the possibility of working only in the end times or periods of strong demand and occurrence of comsunption peaks or in times of prolonged drought with low levels of reservoirs to ensure steady power for consumer service, not being subject to climate constraints, but before to supply/provision of natural gas itself. Therefore, in addition to the fact that natural gas is a fossil fuel, so pollutant although less than coal and oil, and limited, it also sould consider as limiting aspectd to its use in the electricity production, its availablity, if there are risks regarding its supply.

On the other hand, at the level of thermal generation of electricity, natural gas is competitive in relation to petroleum products, in the range of $ 27.00 per MWh for natural gas compared to average of $ 105 per MWh for oil [8]. The advantages of face to face the other alternatives with respect to generation would not only in eelctrothermal benefits with respect to minors for example environmental impacts on CO2 emissions, or auspicious us open paths to technological progress and innovation, but also in the context of costs affects its use as fuel.As shown in the above table, based on top of the Brazilian reality of the second half of the first decade of the years 2000, the cost of the Mhw thermoelectric generated with the use of natural gas in less surpasses the fourth part of the obtained by the use of oil derivatices, especially the fuel oil, running just above the achieved through the use of coal.

According to Aneel [9], the generation of electric power to make use of natural gas is through the burning of this fuel in gas turbines. The gas turbine is the key equipment for thermal generation and that once coupled to a generator (Turbo) transforms the energy contained in natural gas into mechanical power, in turn converting it through a generator into electrical energy.The thermoelectric generation with natural gas still has as advantages the relatively short period to maturity of the enterprise and the flexibility to meet leading charges. Relate to the peak of demand/consumption of electricity, which can both refer to a few hours of the day (for example: 5:00 pm to 9:00 pm), as well as the weekly, monthly demand, etc. However, the gas turbines show extreme sensitivity to climatic conditions (especially with respect to environment temperature), in addition to submit substantial changes of thermal efficiency in case of operation at partial charges.

To Almeida [3] and Santos et al. [6], the role of natural gas as a source of strategic power worldwide showed a significant increase since the years 1980/1990. This evolution would occur mainly due to smaller environmental impacts that result from the use of natural gas in relation to other fossil-based energy, oil and coal. In fact, despite being often characterized as a clean fuel, natural gas, in fact, cannot be so considered fully. In fact, natural gas is, in general, causes less impact to the environment than oil and coal. Thus, by way of illustration, it is mentioned that the use of natural gas in appropriate equipment results relatively less polluting than burning diesel oil. Natural gas allows for combustion with high thermal efficiency, as well as control and adjustment of the flame, allowing the achievement of reductions in the intensity of energy consumption in the segments in which it is used in industry, commerce, services, homes and transportation.

Depending on what is highlighted by Praça [10] and Rodrigues (2) and Guerra [11], with respect to the use of natural gas in electricity generation, it should be registered that from the years 1980 a profound change as regards to the technological paradigm of world electric generation, in particular in the case of countries holding a reduced hydroelectric potential or that it was already largely or even fully tapped. That was the picture of the more advance organic-central countries like United States of America, Western Europe, Japan and most industrialized Asian countries, among others. In fact, the electric generation in these countries, until that time, featured a deep dependency on nuclear or thermal power plants. To complement that picture there were natural gas generation units directed to meet the peak demands. In effective terms, these are areas of almost exhaustion or lack of water resources to support electric generation. Therefore, in these cases, the gas option represented a high end solution and relatively less emitting than other fossil fuels, in addition to not imply in nuclear risks.

In fact, because of what Rodrigues and Guerra state [11], it would be only in the twentieth century and especially in the context of the American market that natural gas would emerge as a clear option in terms of energy availability/avapplication, assuming thus great importance while promoter element of progress and development of the United States of America at the socioeconomic level. However, in terms of other countries and regions related to the «Central Organic Core» of capitalism-world, natural gas input would occur much later, particularly in the period after the Second World War. In the case of organic-central economies, natural gas consumption focuses on three major markets, namely: production of heat/steam in industrial activity, electricity generationl and domestic sector (heating and cooking).

In terms of countries integrated into the development process of the world economic system, the interest in natural gas is relatively recent, thus seeking to define the degree of penetration in terms of the energy matrix, as well as the potential uses/markets. These, in turn, are those that are the most advantageous for that energetic, regarded as the noblest markets, namely: domestic consumption and petrochemical sector (actually, gaschemical).

Nunes [12] points out that the gas-electrical generation grows, at the level of organic-central countries, with the simultaneous liberalisation of energy markets, as well as with the availability of natural gas in its liquefied version and the role to be played by the same. Indeed, at the beginning of that process, tends to assign to gas generation the nuclear role to respond to peaks in demand for electricity, while the generation-base is ensured, for some more adequate alternative (s) and that were stated in the context of each case history (nuclear, coal or water route).In fact, in the 1990s, in the context of organic-central countries, they would bring with it the full affirmation of the natural gas-electric generation, which happens to be hegemonic in the first five-year period of the 21st century. Such is related to aspects of essentially economic order, since the electric-gas generation which uses combined-cycle technology presents greater competitiveness than the alternative of open cycle gas turbines. The energy-fuel standard has physical environmental limits, in particular in the case of electricity of carbon/oil base in thermo-industrial processes and environmental heating.

Therefore, the entrance of the natural gas would only make sense in the context of the total energy demand decline, in the search for new patterns of consumption, to achieve higher levels of energy-productive efficiency, in diversification of energy sources for electricity generation and in the provision of thermal energy (as a result of technological advance), since the energy-fuel standard bounds (environmental and physical), especially in the case of electricity of carbon/oil base in the thermal-industrial processes and environmental heating.Furthermore, natural gas, in the context of organic-central countries makes perfect sense because of efficiency gains, primary energy degree, modernization/sophistication of equipment, costs and lower environmental impacts compared to fossil-based energy. Thus, the at the organic-central level holding capital and technology, in addition to non-big water potential, natural gas is the right choice to adopt energy levels, either in terms of generating electricity, or environmental level.

On the other hand, on account of which highlight Garcez [13] and Januzzi and Swisher [14], the consumption of natural gas in the case of organic-central countries of the northern hemisphere, plants would tend to grow not only through the thermoelectric generation, but also at the level of intermediate uses, notably regarding technical-productive and thermal-industrial processes.The thermoelectricity is inherent in many productive-industrial processes and diverse process technologies, beyond base impelled by energy that trigger basis and operate machinery/equipment in a number of technical-manufacturing units and countless phases/stages of various industrial processes of production. The fact is that in these countries use the fossil fuel for producing electricity. Natural gas is the fossil fuel that has less adverse impacts on the environment, generating less waste/emissions, as well as introduces other technical-economical, energy-industrial and operational character, in order to be considered, by some, as a clean energy source, that is not in full, due to its fossil origin.

Borelli [15] registers that in the case of Brazil, the increased use of natural gas is strongly associated with thermoelectric generation (in this case, gas-thermal), trajectory that in the situation of a country with water-based electricgeneration, immediately refers to the cost of a kilowatt-hour (Kwh) generated by the gas-thermoelectrical component as a condition *sine qua non* to the installed generation capacity expansion.Therefore, the issue of competitiveness of thermoelectricity, in particular the gasthermal variant, then depending on the viability of investment projects, the definition of directions between hydroelectricity and thermoelectricity/gas-electricity and even the possibilities of complementation between the two electric modalities of generation. The issue of productivity/competitiveness of gasthermoelectricity takes on greater relevance when one records that the price of natural gas determines 60% of the final price of the energy generated.

The gas option on the part of a developing country with a high hydraulic potential underused, but counting on a whole technological framework and expertise in terms of engineering and hydroelectric managerial-organizational capacity finds serious problems to come true, at least on a large scale. The truth is that an electrical system must ensure quality/ensure the provision in full time, and may not be based solely on water basis and should resort to storable energy sources or not - in the first case with fossil fuels coal, oil and uranium; and, in the second with renewable sources (solar, wind, etc.), in order to ensure the amount of energy that can effectively count on (solid energy). A water pillar system will depend on the flow regime of the rivers, and it is not technically possible to generate all of electricity at the time of floods, store it and provided it for consumption in times of drought, since the generation and consumption of electrical energy occur at the same time, although one can expand the level of potential energy from the total or partial use of the primary source.

Zoratto´s considerations [16] are taken to point out that the gas thermoelectricity implies a strong dependency of the vast majority of peripheral/semiperipheral countries, although holders of reserves at quite substantial levels.The fact is that the gasthermal option presents a strong technological nature, i.e. with generating units with a high level of technological development and acting as technology diffusion in terms of processes and equipment. Such plants are practically imported in their entirety because the low level of penetration of natural gas in peripheral/semiperipheral societies makes it possible to obtain economies of scale that would stimulate local fixation of companies producing equipment, in which could constitute a virtuous process of import replacement.So, this brings a strong reliance on implicit technological nature in terms of installation, operation, and repair of thermal-gas plants within the Periphery/Semiperiphery. In these cases, opt for natural gas leads to losses by the side of the balance of trade (imports of equipment, spare parts and even natural gas), as well as the balance of services.

In the case of a developing country, thermoelectric generation by natural gas implies strong technological root constraints, which can intensify the level of dependence in this area, already quite high. The problem becomes much more serious when this country is a holder of a huge water potential, still underused, though keep a significant volume in terms of water generation. Training and technological basis arise from the use of water-based and can come to boosting industrial/technological element regarding the gas generation intended to meet the point of the system.The expansion and strengthening of water generation could imply in the process of learning which would result in gas generation, internal production of gas equipment and the creation of productive-technological scale. In other words, in a context like this, natural gas could be used to secure the electrical energy produced by the system. In addition, in the universe of the thermoelectric plants powered by fossil fuels, plants by natural gas are far less pollutants than coal or oil-fired plants, emitting less CO2 and less aggressive impacts on the environment. As disadvantage there is the fact that the electricity can be generated from sources other than the general fossils and natural gas in particular in solar, wind, biomass, etc.

On the other hand, natural gas has more noble uses than burning in a thermal power plant, especially in industrial production, which reveals as a moderniser of equipment, processes and products, coming to end element in promotion/dissemination of technological progress. With that, on would not lose the opportunity to have natural gas as energy-industrial resource, foster/enabler of a national industrial of leading equipment. On the other hand, the hardest decision seems to reside in the electric-gas option.This, to be deployed, it should be like this only at the leading point of the system. The electric-gas projects are expensive, require huge investment and high levels of capital, although with maturation periods less wide than the dams, as well as a high level of imports in terms of equipment and technology, which will eventually burden the balance of payments, primarily by the side of the trade balance.The investments of large transnational manufacturers of equipment would be used once the minimum required scales were created.

However, in a country of water base clearly underutilized (the clear case of Brazil) and counting with a multitude of possibilities in terms of thermal generation, the electric gas generation (at the base) should be better thought/reflected even for a horizon of long or very long term.In fact, in a long or very long term, once effectively sold out the huge and underutilized resources, the Country must not discard the gas thermal option to start adopting it to secure the tip, but must prepare for such, in terms of industrial and technological production. Thus, the thermal gas generation, in the case of a country with the characteristics of Brazil (with hydric predominance and subuse) should consider the gas thermal option, at first and for many years, to secure the tip of the electric system, modernizing the existing electrothermal unit and replacing the thermals which operate by using conventional fossil fuels, so as to make them less pollutants and reduce CO2 emissions and other substances.On the other hand, one should think about the industrial use of natural gas, replacing fuel oil, electricity, and supply new industrial units into operation and in which the energy gas alternative show clear advantages.

From there, natural gas could become important in terms of self-generation and cogeneration. However, it would be about the electrical generation that natural gas could accomplish the greater share of its energy potential. However, it would be first to enforce the electrical hydric potential still used to think in the planned expansion of the electrical gas generation. But the most important aspect is maybe linked to the installation of an industrial park destined to the production of equipment for the energy use of natural gas. This would be in terms of production, transport and distribution. However, it would be the at the level of electrical generation (at the base) that the main trade would focus on, which would be incoherent due to the effective and potential current universe of energy resources in Country

## Final Considerations

Natural gas input in the Brazilian energy matrix is notorious and must grow. However, the haste in face of the electrothermal generation is questioned, due mainly to the high potential for hydroelectric generation from Brazil, which uses by 1/4, although the recent entry of hydroelectric projects, especially is not considered, mainly the Belo Monte dam. On the other hand, the combined cycle technology is expensive and controlled by a small group of transnational corporations, which apparently, at least for now, have not shown great interest to settle in Brazil, with all its production line and their respective (and desirable) linkages with national or transnational companies that come to install equipment, parts, components and the entire line of equipment in Brazil, as occurred with hydroelectricity.There are more pressing uses for natural gas in transport and trade/distribution, and the same could prove to be a large industrial sector energy, with more sophisticated products, refining equipment, replacing fuel oil, displacing electricity in electrothermal processes, in addition to serve as a basis for automatic generation/cogeneration processes.

The issue of having natural gas as an energy source effectively alternative, although fossil, becomes relevant with its thermoelectric use. This, in turn, implies the use of equipment with high degree of incorporation/technological complexity in particular the gas turbine, the demand for towering levels in terms of training, generally present in large transnational companies of oligopolistic base, holders of a degree of extreme prominence at the level of of capital concentration to support the increasing efforts in R&D and RD&I. Thus, there has been highlighted that this segment presents innovation and incorporation of technology as competitive basic elements driving the process of capital accumulation and reproduction. Therefore, the question of having natural gas as an alternative energy source, in what refers to the electrothermal generation has to do with the possibility to promote access to this technological base and to make possible the necessary training.

Therefore, either in the case of the production of aluminium, or in the hasty natural gas into thermoelectrical generation, global power imposes its logic and limits the Country's goals in terms of an effective process of sustainable development.It is best to take advantage of the natural and energy resources, to promote an authentic national development strategy, promoting the installation of productive chains and potentially related to these industrial segments, in order to enable the Country to increase the added value of their production, promote a new cycle replacement for imports with sectors technologically more advanced and industrially more integrated , enable it and promote its authonomy in industrial, productive and technological terms.

Thus, the large investment in hydroelectric plants for the production of aluminium could be more than recovered with domestic production and installation of large value chain in this sector. On the other hand, natural gas, while postponing thermoelectric generation for a later time, could also serve as a basis for the implementation of a dynamic/sophisticated in terms of equipment, enabling uses and energy-productive alternatives. With that, the more harmfull would blur on the environment.

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