

## Global Challenges at the Intersection of Trade, Energy and the Environment

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# An Industry Perspective on Transport and Transit of Energy<sup>1</sup>

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# **An Industry Perspective on Transport and Transit of Energy**

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## **INTRODUCTION**

Energy resources are sometimes remotely located from demand centers. Energy resources abound in some countries whilst other countries do not have enough. This energy imbalance across geographic regions and countries creates a need for transportation to get the energy to where it is most needed. The geographic distance between energy resources and demand centers requires the construction of physical infrastructure and market rules to facilitate trade for the benefit of all.

Energy transport is the movement of energy or energy materials from one country, the exporter, to the destination country, the importer, through one or more countries (transit countries). Making energy available where it is most needed enhances regional economic development through improving energy access, supply, security, reliability and quality and ultimately provides increased opportunity from trade.

The ease of energy transport and transit are affected by factors such as physical infrastructure capacity, investment, political stability, pricing, tariffs and subsidies, government regulation and sometimes political stability. Some of these factors may be interrelated. In this paper, I will discuss some of these factors with particular reference to electricity and natural gas transportation and transit, and from an industry perspective.

## **Challenges**

### **Infrastructure**

A robust interconnected transmission grid is a pre-requisite for reliable electricity transport from generation sources to load centers. Similarly, pipelines of sufficient capacity are required for gas transport. In some regions of the world, adequate infrastructure for power and gas transport remains a challenge.

For example, some adjacent countries in the West Africa region such as Liberia and Ivory Coast have no interconnecting power transmission infrastructure for emergency or economy power transfer. Other countries have low interconnection capacity with limited reliability margins. Currently, the electricity sector in the West Africa Power Pool (WAPP) member states provide power supply to only about 30% of the population of about 250 million. The present electricity demand is about 15,000 MW, but only about 6,500 MW is being met. While the shortfall in power supply is largely due to inadequate generation capacity, a significant portion is due to inadequate transmission capacity. While Nigeria has abundant natural gas resources to meet the demand of the sub-region, limited pipeline infrastructure contributes to the inability to transport natural gas to countries in the region. The only gas pipeline in the region terminates in Ghana and it is yet to realize the free flow of natural gas. There are challenges that affect the financing

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and construction of infrastructure. These challenges include (i) non-uniform standards and (ii) technical operational differences.

(i) ***Non-uniform standards***

Different countries in the West African region have different transmission and distribution voltages. For example, la Cote d' Ivoire operates its main transmission network at 225 kV whilst Ghana operates at 161 kV. To realise an efficient and least cost interconnection between these two systems an auto transformer had to be installed thus increasing the cost of the interconnection facility. Also grid infrastructure planning is not done on a regional basis. Each country plans its energy infrastructure with a focus towards its internal needs. Past attempts to interconnect countries have sometimes been deadlocked because neighbouring countries could not reach compromises on differing standards. There are obvious benefits to region-wide planning. The establishment of the West African Power Pool (WAPP) seeks to harmonize many of these differing standards. For example WAPP is constructing a 330 kV coastal interconnection line from Ghana through Togo and Benin to Nigeria. Additional 330kV lines are being planned to interconnect Ghana with la Cote d'Ivoire, Burkina Faso and Mali.

(ii) **Technical and Operational Challenges**

Technical and operational issues also limit the ability to transport power across borders. System stability issues constrain power system operators from increasing transfer capability for economy power transfers. This is in part explained by inadequate interconnection capacity and also by large swings in Area Control Error (ACE).

For example, in 2007, there was a need for emergency power purchase from Nigeria to mitigate supply shortfall in Togo, Benin and Ghana, however this could not be achieved as a result of system stability issues.

(iii) **Allocation of cross- border transmission costs and benefits**

For network infrastructure systems such as power transmission cost allocation and project cost recovery are important issues that need to be well defined to encourage investment. It is difficult identifying beneficiaries to whom transmission infrastructure project costs must be allocated. In some cases, attempts have been made to socialize project costs but this has been met with protest from groups who believe they are not the beneficiaries. For example, utilities in the western regions of PJM Interconnection LLC in the USA have successfully rebuffed attempts by PJM to socialize major large transmission projects arguing that their rate payers are not the beneficiaries of those projects. These challenges not only delay investment but sometimes prevent them.

- The industry must address the cost allocation issue and adopt a methodology that is fair and reasonable to allocate project cost especially in networked systems. The methodology must address difficult issues such as: The applicable discount rate
- Assumptions used to determine project benefits
- Time frame to be used for measuring project benefits and costs

- Benefit/Cost ratio needed to justify project construction and cost allocation

### **Investment climate**

Investment in energy transport and transit infrastructure are often large with very long payback periods. Investors are very cautious of the business and financing risks. Investment is needed not just to meet current demand but to continuously meet increasing demand. Adequate and timely investment is therefore paramount. There are a number of factors that affect the ability to attract investment in support of energy transport and transit which include political, economic, social, technological and legal concerns.

Establishing and maintaining political stability is necessary for investment in energy transport and transit infrastructure. Many countries in Africa have enormous energy supply potential but investors have stayed away because of political instability. One such country is the Democratic Republic of Congo which has enormous energy resources such as hydro, but investors are wary of political instability and have thus stayed away.

In some cases, challenges with maintaining law and order frustrate investment in energy transport and transit infrastructure. For example, one of the challenges facing the operation of the West African Gas Pipeline Project (WAGP) intended to supply gas from Nigeria to Benin, Togo and Ghana is vandalism. In February, 2009, bandits attacked the Gas Processing Plant in Nigeria, and forced the plant to shut down.

### **Opposition from Environmental Groups**

Environmental groups have contributed significantly towards harmonizing the need for large scale energy projects and protecting the environment. Thus most projects require thorough environmental impact studies for approval. There are cases where environmental groups have forced project sponsors to examine viable alternatives. There are also cases where extreme elements of these groups frustrate, delay and stop “good” projects at all cost.

For example, construction of electric transmission lines are held up by lengthy permitting processes because of litigation from concerned local activists and environmental groups. In many cases, these challenges delay projects for so long that financing dries up and the projects are abandoned. An example is the opposition to projects like Sunrise Powerlink Project (San Diego), a 1,000-MW transmission line that would transfer geothermal energy from California's Imperial Valley to the San Diego area.

### **Tariff /Pricing**

Tariff setting is critical for attracting investment into the industry and catering for infrastructure development, maintenance and expansion. Tariff setting in some of the individual countries/institutions in West Africa has not always reflected the long-run marginal cost of production and transportation. Very often economic or social circumstances have been articulated as necessitating subsidization and or lowering of actual costs relating in this context to transportation, but unfortunately taking the West African experience, Governments have often

not made good their commitments to pay up the subsidized cost components when required. Current government regulations needs to be changed to allow full cost recovery of energy investment and eliminate subsidies.

### **Conclusion**

The issues discussed in this paper are by no means exhaustive, however they are in my view some of the key issues to be considered towards achieving an effective and efficient energy transport and transit system.

The Graduate Institute's **Centre for Trade and Economic Integration** fosters world-class multidisciplinary scholarship aimed at developing solutions to problems facing the international trade system and economic integration more generally. It works in association with public sector and private sector actors, giving special prominence to Geneva-based International Organisations such as the WTO and UNCTAD. The Centre also bridges gaps between the scholarly and policymaking communities through outreach and training activities in Geneva. Its goal is to provide an innovative research basis for solutions that address the medium-term challenges facing the world trade system broadly defined and economic integration more generally.