

## CLIMATE ENERGY NEXUS: CALL TO ACTION: COAL

### COAL

This “Call to Action” focuses on coal. By some estimates coal currently accounts for about 80% of the primary energy utilized in industrial production worldwide, including more than 40% of the planet's electricity.

What is coal? Very broadly, millions of years ago as forests died for a variety of reasons, very large numbers of them were buried under soil. The soil deposits increased steadily with time, the vegetation became compressed and the temperatures rose. However the vegetation was protected from oxidation by the clayey environment in which it was buried, resulting in the dead vegetation being slowly changed to coal, consisting primarily of carbon... However because of the wide variation in the range of environments and in the length of time in which such deposits remained buried, the characteristics of coal in the different locations vary widely.

Industrial coal types are normally subdivided into three major groups:

1. Lignite, the youngest of the group. Normally very moist, must be dried before burning. Used primarily for home heating and limited electricity generation in some European countries.
2. Bituminous. Dense sedimentary rock. Black. The type most often used for power generation internationally.
3. Anthracite. Hard, rocky coal. Used primarily for heating residential and commercial buildings. Low in volatiles.

As power generation is the focus of this presentation, bituminous coal will be the type considered in comparisons with alternate fuels.

## Power Station Emissions

The emissions (pollutants) of primary concern from power stations include:

- sulphur dioxide
- Carbon dioxide
- Nitrogen dioxide
- Mercury
- Ozone
- Particulates
- Ash

The effects of these pollutants on the local environment vary. With some the effects, sulphur-- and nitrogen-dioxide, particulates and ash for example, the environmental concerns are predominantly local. With others e.g. carbon-dioxide, ozone, the environmental concerns are global in nature.

The National Environmental and Planning Agency (NEPA) determines the allowable concentrations of these constituents in the environment and undertakes periodic checks of each at the appropriate locations. The frequency of checks varies with factors such as the particular pollutant being measured and the location of concern, for instance population density, proximity to sources of pollution, etc.

## Natural Gas

Natural gas is the fuel now being considered for power generation in Jamaica.. When burnt for power generation it, typically produces lower levels of atmospheric pollutants than coal. In particular, for any given quantum of electricity generated, production of carbon dioxide, sulphur dioxide, mercury, particulates and ash are significantly reduced.

Currently use of natural gas for power generation has been increasing sharply internationally, primarily because with that fuel the investment

costs of generating equipment are lower; energy in the fuel fuel is converted to electricity more efficiently; the operating and maintenance costs are lower; and the concentration of pollutants is also lower. These factors all add up to electricity being produced at lower costs and lower adverse environmental impact with gas than with coal . Until recently the cost of natural gas in the U.S. was relatively high and coal was most often the fuel of choice for power generation, providing more than 50% of the nation's electricity supplies. . With the development of so-called “fracking” of gas at depths not previously economically feasible, tremendous new gas resources are being exploited, and the price of gas in the United States has fallen dramatically, As a result more gas-fuelled generating plants than coal-burning are now being installed there. However, coal-burning plants still outnumber the gas –fuelled in total annual energy generation, the ratio currently being about 49 to 32.

### **What of Jamaica?**

Currently Jamaica's public power generating plant is relatively old and fuel inefficient. Focusing specifically on the largest steam-generators, the environmental performance does not fully comply with NEPA's specifications. The boilers are not equipped with ash removal systems or particulate controls, The sulphur content in the fuel is high, and the height of the exhaust gas stacks (chimneys) are lower than ideal for widespread dispersal of the exhaust gases. As a result the performance of these plants does not always comply with NEPA's standards. In the 1980's The World Bank recommended replacement of these units on the basis of environmental improvement as well as lower fuel consumption

Towards the end of the last century JPS, then government owned, designed, a new coal-burning power station to be installed in the Salt River area. The design met with NEPA's approval, and was favourably reviewed by competent international consultants. However the Government did not allow the project to proceed, stating that it, the Government, would source LNG from Trinidad at prices which would result in production of electricity at very low prices. That was in 2000. The power supply situation remains essentially the same.

Millions of United States dollars have been spent on the LNG project to date with nothing substantive to show as a result. It is interesting to note that the only two Caribbean countries currently burning LNG, Puerto Rico and the Dominican Republic, are both now installing coal-burning plants as well. They are not abandoning the LNG infrastructure, but it does mean that they do not consider LNG to be the only fuel to be considered as fuel for economic power generation.

Currently the expectations of the Jamaican planners of the LNG-fuelled plant are that the price of LNG will reflect the lower gas prices now being realized with shale gas in the US.. However, LNG is not shale gas. The cost of production, liquefaction, shipment in specialized vessels, re-gasification, delivery to the power plant all result in significant incremental cost increases. As currently planned in Jamaica, the liquefied product will be transferred to the floating storage and liquefaction vessel then on to the Jamaica Gas Trust, transferred by pipeline to the consumer. The cost to the end user must necessarily be significantly higher than the price of shale gas at the source.

In comparison coal would be delivered to Jamaica by relatively simple ships whose investment and operational costs would be much lower than those of the specialized LNG transporters. The coal can be easily transferred from the carrier to the shore, and from there by conveyor belts to the end user within reasonable distances, or by rail to more distant locations. The transportation costs from the point of shipment to the end-user would obviously be much lower than they would be the with LNG.

A further consideration is that the most important factor in determining the price of gas to the consumer will probably not be the costs incurred in providing the supply, but rather the prices of the competition. It is unrealistic, for instance, to project that gas from LNG would be sold at lower prices than that of Bunker C, or diesel for that matter. The price of gasoline is not determined by the costs of producing the fuel, but probably by mercantile decisions in New York, and LNG prices will probably follow suit.

Coal prices have remained remarkably stable over several decades. Massive coal deposits exist on every continent and proven reserves approach 200 years at the current rate of consumption. Coal could never become a political weapon as oil and gas have been on numerous occasions.

The fundamental issue to be decided is selection of the fuel which will provide electricity for Jamaica at the lowest economic cost without undue environmental impact. The arguments most often advanced against use of coal for power generation in Jamaica is that coal is “a dirty fuel”. Opinions expressed in the media and elsewhere warn of imminent danger to health if coal-were to be introduced as fuel for power generation. Typically the objectors do not identify the specific health hazards supposedly resulting from burning coal, neither do they appear to have ever consulted NEPA on the issues, They do not provide evidence of a single instance in which exhaust gases or any other aspect of normal operations have damaged anyone’s health, or the reasons why coal would be a more polluting fuel than the Bunker C currently being burnt.. Replacing the existing oil-burning base-load units with coal-burners would in reality reduce the concentration of the pollutants. The local cement plant, which is located close to a residential area, converted from fuel-oil to coal about ten years ago, with NEPA’s approval, and the quality of the surrounding environment does not appear to have deteriorated.

Some of the pollutants considered to be injurious with coal as fuel but not typically attributed to LNG are really of global impact. These include carbon dioxide, methane, hydrogen sulphide and others. They are relatively low in emissions from gas-burning power stations, but are released in significant quantities in the processes of extracting the gas from the wells and liquefaction, and should therefore be properly included in comparing the global impact of coal with that of LNG.

All studies undertaken to determine the least-cost source of fuel for power generation in Jamaica and which are available for public review indicate that coal should be the fuel of choice. After more than ten years of unsuccessful attempts to source LNG at prices which would dramatically reduce the cost of electricity to Jamaican consumers, there is no obvious reason why Jamaica should not at least do as Puerto Rico and the Dominican Republic have done and allow installation of coal-burning generating units while continuing to pursue cheap LNG, The economy of the country desperately needs relief from the current high electricity costs.

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26 June 2012