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Energy: Gains

Myth of cheap coal power

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This is a response to the article by Mr. Ranjith C. Dissanayake (RCD) titled "Calling for coal-fired power" in the Sunday Observer of October 12, 2003.

Cost to Consumers

Mr. R. C. D., like many others, claims that electricity from coal-fired power stations could be generated at Rs. 4 per kWh. What matters is not the cost of generation but the cost to the consumer. To determine the cost to the consumer the following factors need to be considered:

1. The capital cost of a 1000 MW coal power plant would be US$ 1000/kW. A new coal power plant in Australia with a capacity of 900 MW constructed recently near a coal mine has costed US$ 900 million. In Sri Lanka, as we have no coalmines, we have to import it in ships. We have only one natural harbour or Trincomalee. Until permanent peace is achieved, a coal power plant at Trinco is not "bankable". At all other locations, we need to build a harbour of breakwater. This would cost an additional US$ 200 to 1000 per kW depending on the location. To deliver the energy generated at a large central power plant to the consumers located at different parts of the country we need to construct new transmission lines. This would cost an additional US$ 1000 per kW. In the "Rs. 4 per kWh" claim a value of US$ 1000 per kW has been assumed as the capital cost. The actual value of capital cost will be in the range of US$ 2100 to 3000 per kW.

2. To this we have to introduce a factor to compensate for the transmission and distribution losses. At present this is 22%. But it is hoped that this would be reduced to below 15%.

3. The other important matter to be considered is the **Capital Cost Recovery Rate.** The price of Rs. 4 per kWh is based on **"Levellzed Cost".** This is calculated on the assumption that the capital cost (along with its interest) incurred in the construction of the power plant and ancillaries is recovered at a **UNIFORM RATE THROUGHOUT THE ENTIRE ECONOMIC LIFE OF THE POWER PLANT.** The economic life of a coal power plant could be 30 years. If funds are obtained on "soft" terms, this could be practiced. If a private company invests in a power project, the company would not wait for 30 years to recover the capital. Perhaps, it would try to recover it in the first 5 to 10 years operation of the power plant. During this initial period, the cost of electricity from a coal power plant would be **ASTRONOMICALLY HIGH.**

My prediction of the cost of electricity from coal to a consumer in Sri Lanka would be Rs. 15 per kWh!

Alternatives

If electricity from coal is expensive, then what is the alternative? As we do not have any fossil fuel (oil, coal or gas) in Sri Lanka and since foreign exchange is scarce, we need to look for indigenous resources. Hydropower had been our traditional indigenous resource for electricity generation. However, as our demand for electricity is increasing at around 8% per annum from our present demand of nearly 1500 MW, we need an additional 100 to 150 MW of base-load power every year. We have already developed most of the major hydro potential. The remaining will be developed (hopefully) in the near future. So, we have to look for a non-traditional resource.

Solar PV

Solar PV is very expensive. It is marketed at US$ 10 per peak Watt. With a plant factor of 20%, a unit of energy from solar PV would be 25 times as expensive as energy from conventional sources. Solar PV is more suitable as a stopgap solution to rural households until they are connected to the national grid.

Wind

Capital cost of wind power generation around US$ 1200 per kW. The plant factor of the Hambantota plant is 15%. Perhaps, this could be improved to 25% with better grid, better location and improved technology. Even with these improvements, energy from wind in Sri Lanka would cost 2 times the cost of energy from conventional sources. We cannot expect cheap energy from wind.

Base Load Thermal Power

More over, power out put from wind and solar PV is not steady. The variations are to a large extent unpredictable. To complement our existing hydropower we need some form of thermal power - power generated by the combustion of a fuel. But this fuel need **NOT** be a fossil fuel.

Dendro Power

Sustainably Grown Fuelwood (SGF) is non-fossil and a renewable resource. The Ministry of Science and Technology has conducted a feasibility study to determine the viability of establishing short Rotation Coppice (SRC) plantations in degraded marginal lands in the dry zones in Sri Lanka. This study has identified the optimum parameters for the production of Sustainable Biomass in these locations. The study has revealed that around 20 tonnes of dry biomass per hectare per year could be sustainably grown in these lands. This Ministry has also commissioned two demonstration facilities; One to produce electricity from sustainable biomass (35 kW) and the other to replace furnace oil in a boiler with sustainable biomass.

Following from these activities, a Dendro Power plant with a capacity of 1 MW is being erected at Walapane. SRC plantations with 2 million trees have been already established in the vicinity. This power plant is expected to be commissioned in March next year. Growing of Gliricidia as an intercrop under coconut has been successfully introduced at the Coconut Research Institute. This practice has been extended to many private coconut lands. Many industries are installing biomass gasifiers or boilers to replace imported and expensive furnace oil with Gliricidia cuttings. For every tonne of oil replaced with biomass the industries are saving Rs. 16,000. Villagers in coconut growing areas are gainfully employed in the planting and harvesting Gliricidia.

The total extent of degraded marginal land in this country is over 1.6 million hectares. If these lands are converted into SRC plantations, it will be possible to generate more than 4000MW of base-load power for the national grid. For every MW of dendro power around 250 to 300 persons could be gainfully employed. This would alleviate rural poverty without any financial strain on the Treasury. Moreover, the 1.6 million hectares of degraded land will be converted into sustainable healthy plantations thus preventing further degradation of these lands.

Many dendro power projects in the range of 1 to 10 MW are in the pipeline. These power plants will be embedded into the existing medium voltage distribution lines, thus obviating the construction of new transmission and distribution newtworks. These power plants will serve to meet the electricity demand of consumers in and around the power plants. This will drastically reduce the transmission and distribution losses presently incurred by the CEB without any such investment by the CEB.

Centralized Vs Decentralized

Another benefit of decentralized or distributed generation is the reduction in the number of total grid failures. In the recent past there have been many grid failures extending to large areas. This has happened many times in Sri Lanka. It also took place in the USA, Canada, the UK and Italy etc. The primary reason for all these failures is over dependent on large centralized generation. When a large generator or the transmission line feeding power from a large generator trips, the rest of the system should respond smoothly and quickly by increasing the outputs from other generators in the system. This is achieved by maintaining an adequate amount of "Spinning Reserves". That is generators with spare capacity already connected and rotating in synchronism with the system. If the system does not respond quickly, more generators and feeders will trip - a phenomenon known as cascade tripping. This process ends finally in total blackout in the region. These incidents could be drastically reduced or totally eliminated by reducing the sizes of large centralized generators and locating smaller generators at appropriate locations in the system. The proposed dendro option will achieve this objective.

Other Benefits of Dendro Power

Apart from sustainable fuelwood. SRC plantations also produce foliage. This foliage could be used as cattle fodder along with rice straw. Dung from cattle could used to produce biogas. Effluent from biogas digesters could be used as organic fertilizer. At present we are importing 80% of our milk requirements, while destroying over a million tonnes of rice straw annually. We are also importing 0.5 million tonnes of urea fertilizer. All this could be avoided by expanding our dairy industry and the introduction of biogas systems for energy and fertilizer.

Costs of Feasibility Studies

For the past 20 odd years, CEB engineers have been conducting many feasibility studies for coal power plants. First at Trincomalee, then at Mawella and finally along the West Coast at Norochcholai. For various reasons all these projects were abandoned. However, the total costs of these studies have exceeded Rs. 1500 million. The net out come of these studies is a set of out dated documents. CEB is thinking of starting this cycle once again. It will end up with another set of documents. The sum of Rs. 1,500 million is adequate to establish 100,000 hectares of SRC plantations sufficient to support 250 MW of base load dendro power. Had this been done, we need not have encountered all the power cuts we experienced in the last 15 years. We would have alleviated poverty of 25,000 rural families. We would have upgraded 100,000 ha of degraded land. We would have saved US$ 100 million annually spent on the import of petroleum for electricity generation. We would have avoided air and noise pollutions from all the oil fired power plants.

Role of Electrical Engineers

Mr. Dissanayake suggests the formation of a task force comprising civil and electrical engineers. The tragedy in Sri Lanka is that only electrical engineers are allowed to voice their views. The DGM of the Thermal Power Complex in the CEB is an electrical engineer. The design, installation, commissioning and operation of thermal power plants are the forte of mechanical engineers. The Project Director of the proposed Upper Kotmale project is also an electrical engineer. The design, installation, commissioning and operation of hydropower plants are the forte of civil engineers. In the CEB civil and mechanical engineers are treated as low castes. Electrical engineers should be confined to the System Control, Transmission and Distribution divisions only. They should allow the mechanical and civil engineers to design and operate thermal and hydraulic systems.

Conclusion

Mr. Dissanayake, imagines that a coal power plant at Mawella would be beneficial to the poor Sinhala peasantry in the south of Sri Lanka. But look at the millions of poor Sinhala, Muslim, Tamil, Burgher, Buddhist, Christian and Hindu peasantry in the dry zones in Sri Lanka. Dendro Power will benefit them all.