

RESTRICTED

YAR/06/12

CHALLENGES FOR SRI LANKA ENERGY SECURITY

INTRODUCTION

1. Energy has been the life line of the world in past few decades. It affects directly economy of a country. Despite nature of the country economic strategies are depend on energy. As other developing countries Sri Lanka has been faced energy crisis at several occasions in the history.

2. After 1977 Sri Lanka also adapted to market oriented open economic development strategy. Since then manufacturing industry, factories and services have been developed rapidly and energy is playing the key role of the economy. With the development of financial base economy, basic structure of income of many areas like education, tourism, infrastructures and health were changed rapidly. There were some clear evidences in the last few decades looming of energy challengers in Sri Lanka.

3. The main bureau dealing with energy and electrical power sectors in Sri Lanka are the Ceylon Petroleum Corporation (CEYPETCO) and Ceylon Electricity Board respectively (CEB). CEYPETCO basically deals with petroleum products which includes importing, exporting, refining, selling and distributing. Responsibility of CEB is electrical power generation, distribution and controlling of electricity. Hydropower, biomass and petroleum are the main sources of energy supply in Sri Lanka. Wind energy, solar power, and municipal solid wastes are the minor potential energy.

RESTRICTED

4. Petroleum products generated by CEYPETCO are depending on imported crude oil since long time. In 1950 refined petroleum products were imported basically for lighting, vehicles and some limited industries only. But today petroleum products are utilised for various requirements. Transformations, generating electricity, shipping, industries, agriculture and fishing are the leading sectors that petroleum products used in Sri Lanka.

5. Effective and efficient management of energy is more crucial and complex crux in the present world. Energy has become more obligatory part of the modern family units. So energy is not a merely problem for industries or services. It has become a part of each and every person in the world.

6. The era of ultimate energy supply is over and there won't be cheap sources of supplying energy anymore. Sri Lanka is depended on imported petroleum products. Hence any crises or price increases in energy providing countries affect directly to us. As those crises are beyond the boundaries of policy maker's strategic development plans, energy has become major threat to Sri Lanka economy. Therefore Sri Lanka has to think about energy security in the country.

AIM

7. The aim of this service paper is to identify what the challenges are for Sri Lanka energy security and find solutions for minimize energy risk.

Toll

HISTORY OF ENERGY CONSUMPTION IN SRI LANKA

8. **Electricity** As in all other countries, initially Sri Lanka's main energy requirements were for lightning and cooking. Cooking requirement was almost fulfilled by biomasses. Petroleum products were utilized for lighting. However with open economical concepts in 1977, consumption of petroleum products were increased rapidly. This occurred basically due to accretion of industry in commercial sectors.

9. The main electricity provider of Sri Lanka, CEB was heavily depended on hydroelectric power till 1977. Before 1977, Lakshapana, Iginiyagala, Wimalasurendhra and Ukuwella hydropower section contributed 780 GWh to Sri Lanka electricity grid. Kelanithissa thermal generation station provided 120 GWh and total power of 900 GWh was sufficient for the demand.¹ The main deficiency of hydropower depends on climatical condition. As hydropower was not reliable a source of electricity thermal power plants were introduced. Since then island's electricity requirement was shared by hydropower and thermal power.

10. Demand of electricity increased after open economical concept in 1977 and generated electricity was not sufficient to cater the requirement. Thus power crises began and government had no proper and long lasting programme to overcome this situation. However 2800 GWh of electricity was generated by hydropower station built by Mahaweli project and Sapugaskanda thermal power generation station. The power generation in year 2000 by both hydropower and thermal stations were 3840 GWh² and was sufficient for the demand.

¹ Sri Lanka Energy Balance – Compiled by Sri Lanka Sustainable energy authority electricity generation data year 1977<<http://www.info.energy.gov.lk/>>

² Ibid year 2000

RESTRICTED

11. In year 2009 the total electricity generation was increased to 9900 GWh³ and main electricity supply was depended on thermal power.

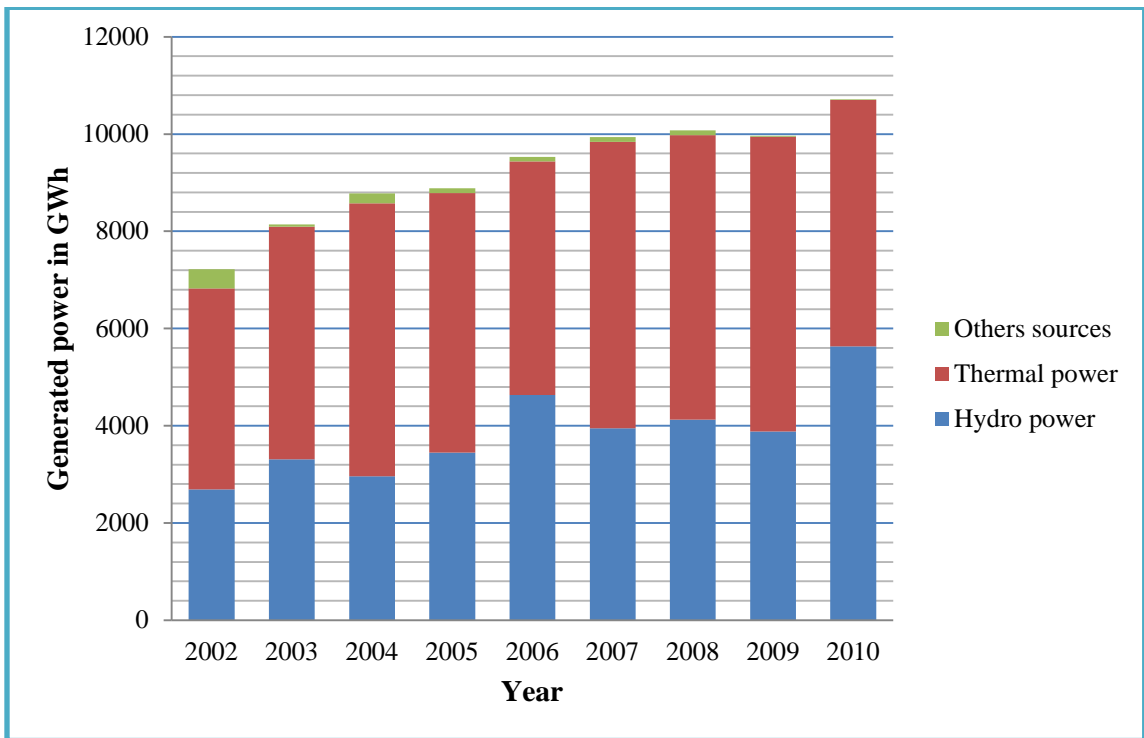
12. However island faced several energy crises and high electricity cost during last three decades. As country deepened on thermal power plants unit price of electricity increases rapidly. In 2001 average unit price of electricity was Rs 4.50 and it rose up to Rs 8.00 per unit. In 2009 it was Rs14.94.

13. **Petroleum products as energy resources** CEPETCO is the main institution with petroleum products in Sri Lanka. It was established in 1962. The main objective of CEPETCO is import, export, distribution, selling and researches of petroleum products in Sri Lanka.

14. The only refiner available in Sri Lanka was established in year 1969. It is operated under the CEPETCO and it provides 45% of petroleum products requirement of Sri Lanka by refining 50000 barrels/day. But main disadvantage of this refiner is that 40 % of its products are residual fuel oil and losses old technology. However new project is in progress to expand present Sapugaskanda refiner (SOREM project) with new technologies.

15. As electricity generated by thermal power plants demand on petroleum products increased rapidly.

³ Ibid year 2009



Graph – I: Power Generation by Hydropower and Thermal Power Plant from 2002 to 2010 in Sri Lanka⁴

⁴ Ibid year 2002 to 2010

RESTRICTED

16. **Reasons for high cost petroleum products in Sri Lanka** We have spent USD 2.2 billion in 2009 and USD 4.8 billion in 2011. This rises 21% in 2009 and 24% in 2011 from the gross imports respectively. In 1970s this figure was about 25% but then 92% of it was spent on crude oil. The rest was spent on importing refined petroleum products. This situation changed rapidly from 1980s and has created a completely difference situation. In 2011 the cost on refined petroleum products was a higher figure of 65% from the gross expenditure.⁵ The reasons for these changes are higher demand for petroleum and limitation of the capacity of our refinery. Therefore more and more petroleum products have to be imported to meet the higher demand.

17. Several problems have been created on the supply of petroleum with the new sanctions regarding Iran by United States. It is expected this will affect the countries like Sri Lanka badly. Only Iranian and several such other types of crude oil can be refined in Sapugaskanda refinery. This is also a technological problem. Although discussions have been started with several other oil exporting countries to be supplied such crude oil and find a solution. But the refinery should be modernized with new technological process. For these challenges may spring up in future also. Unstable political situation in Middle East countries can be seen from 1950s. And there had been internal conflicts in these countries so there sprang up many problems on supply of crude oil. Same situation can be seen even today. So it is time for us to be changed to a new stable supplying process of crude oil. It is difficult but will bring long-term benefits.

All those reasons can be summarised as follows

- a. Low production of crude oil due to political instability in OPEC countries.

⁵ Central bank report 2009 and 2011

RESTRICTED

- b. Economic sanctions to oil producing countries by western countries.
- c. High consumption in local market and depreciation of value of Sri Lanka Rupee wrt USD.

18. **Power generation through sustainable energy sources** it can be observed Sri Lanka has paid less attention to use sustainable and renewable energy sources to fulfil country's energy requirement. As an island Sri Lanka has ability to manipulate following sources as energy in various stages.

- a. **Wind Power** As an island potential for using to generate wind power is huge. Though there is a little electricity producing plant in the country utilising wind power, it is not considerable. Coastal belt of Hambanthota to Kirinda, Puttlam to Jaffna, Trincomalee and part of hill country Abaywala, Uva basin and Knuckles and Rakwana area have identified for the suitable areas to establish wind power plant in the island.
- b. **Solar power** Location itself of Sri Lanka is most suitable for utilising to produce electricity. Though it cannot supply electricity to national grid, solar power can be utilised to fulfil electricity requirement of people living in inaccessible areas, north and east areas.
- c. **Biomass** Biomass are generally use in rural areas in Sri Lanka for cooking purpose. However it has been found vegetable oils can be utilised for even as alternative for diesel.

RESTRICTED

19. **Present situation of energy sector in Sri Lanka** Petroleum usage in Sri Lanka has rapidly increased in the last decade and following reasons can be found for this situation.

- a. As the demand of electricity increased high amount of petroleum products are used for thermal power plants.
- b. High usage of vehicle and other machineries in industry.
- c. High usage for fishing industry.
- d. Agriculture industry.

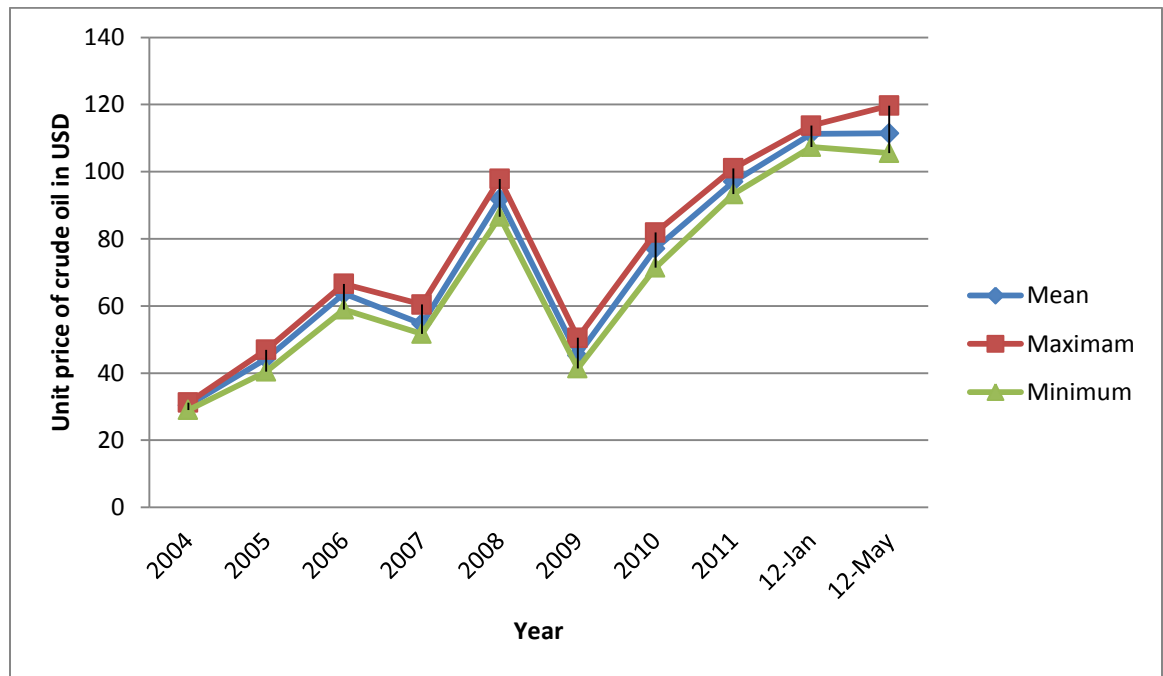
20. High amount of energy wastes due to large traffic congestion in the school, office hours and in proper maintenance of vehicles and machineries. This amount has calculated as Rs 1200 million for year. As petroleum prices are closely link to unit cost of electricity increases with oil prices. In Sri Lanka approximately 70% of electricity is generated by thermal power plants.

21. In year 2003 the petroleum market was open for competition with Lanka Indian Oil Cooperation (LIOC). Since then they entered to local market for importing and retailing petroleum products. They shared 30% of petroleum distribution in Sri Lanka.

22. Presently CEPETCO is function with decrement and their loss in last year was Rs 93 billion. The main reason for this is they distributed petroleum product like super diesel, kerosene, naphtha and burn oil with lesser price than those imported or producing cost.

23. From year 2010 to 2012 price of crude oil barrel has increased rapidly. Not only crude oil price all other petroleum product prices have increased simultaneously.

24. Government has reduced taxes on petroleum product tremendously. Still we pay very high price for petroleum product due to high cost of crude oil in international market.



Graph – II: increasing of price of crude oil barrel from 2004 to May 2012 in the world⁶

⁶ Crude oil prices, live charts <http://www.livecharts.co.uk/MarketCharts/crude.ph>

RESTRICTED

25. The main development project conducting by CEPETCO is the SOREM project which included extension of Sapugaskanda refiner. Present capacity of Sapugaskanda refiner is 50000 crude oil barrels per day and after expanding it is expected to increased capacity up to 100000 barrels per day. The other main advantages of expanding refiner are reducing generating of burned oil and losses. It is expected to 90% of petroleum requirement to be fulfilled by this project.

26. Laying new pipe line projects from Colombo harbour to Sapugaskanda and to new airport location at Matale from Hambanthota harbour also in progress.

27. **Present Situation of Petroleum exploration in Sri Lanka** TGSNOPEC deals with petroleum exploration process in Manner within an area of 5700 km² and the process steps in to a new era in 2007 an international open tender was called for another research within 3000km². As a result Carein Lanka (Pvt) Limited agreed with Sri Lanka government to deal with petroleum exploration process commenced on 07 July 2008. It is the beginning of golden era petroleum searching process in Sri Lanka. According to this agreement the company, Carein will deal with petroleum research for 8 years. Already they have completed the work of three drillings. Hydro-carbon has been found in two drillings and it is a sign of future victories. They have spent almost USD 200 million for 1st step. They are expecting to complete 2nd step by 2013.

28. **Nuclear power plant in Sri Lanka** Electricity plant based on nuclear reactors is called nuclear power plants. Nuclear power plants are the latest solution for the growing energy crises in many of developed countries. USA, Germany, Russia, China, Japan and India are the countries commonly experiencing nuclear power in the world. Though there are some limitations

RESTRICTED

of introducing nuclear power plant, the amount of electricity produced by nuclear power plant is very high. Nuclear power plants are long term economical electricity generation plants.

29. As per the government officials Sri Lanka has planned to have nuclear power plant in year 2030 with the capacity of 1000 MW. Feasibility study of the plant will begin soon with the assistance of the Atomic Energy Authority

30. **Demand on Electricity** In year 2003, 46% of electricity generation was depended on hydropower. Presently 65% is shared by thermal power. The main disadvantage of the thermal power is high production cost. It is required high amount of petroleum products. It has estimated Rs 22.00 required to produce one unit (Watt) of electricity by thermal power. As we depend on thermal power plants and hydropower there can be identified some important factor effects for the high cost of electricity production.

- a. Hydropower merely depends on climate conditions of the countryside.
- b. Rapid increase of crude oil price in the international market.
- c. Delay in repeating major power generation projects.
- d. High percentage depends on thermal plants.

31. Average selling price of electricity unit is Rs 16.00 and production cost is Rs 20.00. Therefore Ceylon Electricity Board performs with hedge losses.

RESTRICTED

32. Coal plants and nuclear power plants are the option for Sri Lanka energy requirement. Coal plant with capacity of 500 MW has scheduled to build in Sampur area. Ongoing hydropower project of upper Kothmale is planned to provide 150 MW electricity or national requirement.

33. **Effect on economy** Sri Lanka is presently a middle income country and looking to reached developed margin. Though we are seasonable to become a developed country with respect to human developing indicators, our income has not reached desired level to achieve the standard of a developed country. Therefore our economy has to be developed and energy play a major role in this regards.

34. The main energy producing sources identified in the world are natural and artificial. In Sri Lanka it is only natural sources and we have not experienced artificial energy yet. Nuclear energy has identified as artificial energy. However Sri Lanka also has intention to build nuclear power plant in year 2030.

35. Following method can be identified as unnecessary energy losses in the county.

a. **Reducing of power wastage** it has observed high amount of electricity is wasting due to in-proper use. 10% of energy is wasting due to this and it cost Rs 20 billion per year.

b. **Reduce traffic congestion** establishing proper highway network is the most effective method to reduce traffic congestion in the country.

RESTRICTED

- c. **Reducing power distributing and transmitting losses** As per CEB total system loss of electricity are 21% of total product where in Japan it is only 7%.

CHALLENGERS FOR SRI LANKA ENERGY SECURITY

36. As per International Energy Agency (IEA) definition energy security primarily in terms of stable supply of oil and natural gas. But this definition does not address micro and multinational level need of developing countries ESMAP has redefine energy security is a country's ability of optimise its energy resources for future and supply of energy services for the desired level of services that will sustain economic growth and poverty reduction⁷.

37. However the definition of energy has changed over the year. In the period past 1970 s oil stocks, the definition of energy security related to the avoidance of oil supply risk resulting from potential disruption of crude oil from the Middle East. But now there are so many other factors effect for fuel supply stability and increasing of energy price have been added to the early energy security definitions. The other factors effecting for the energy security of country is political conflicts, unexpected natural disasters, concerns on terrorism and energy related economic changes.

38. Since OPEC oil embargo and Iranian revolution threaded to cause price increase in 1970s. The concept of energy security evolved major oil crises of the world. This effected to Sri

⁷ Dr Parag Divan, Dr AN Sarkar Energy Security New Delhi: Pentagon Energy Press, 2009 p.03

RESTRICTED

Lanka badly as we depends on imported petroleum product and crude oil. Therefore it is very much important to study factors effecting for energy security of Sri Lanka.

39. USA, China, India and Southeast Asian countries rapidly increased their industrial development and demand on petroleum product has accelerated in past few decades. Due to this and some internal and external influences in oil producing countries price of crude oil increases rapidly.

40. Demand on petroleum products and electricity have been increased rapidly in last decades in Sri Lanka due to changing in life style and development of industries. As discussed before the capacity of refiner at Sapugaskanda is 50000 barrels per day and it comply only 35% of petroleum requirement of the country. The rest of the requirement has to import as distilled petroleum product and distributed. The main challenge facing is large amount of petroleum product are utilized for thermal power plants at Sapugaskanda, Kelenithissa and Kelewarapitiya.

41. The other challenges facing by the country is rapid increases of petroleum product prices in the international markets in the past few decades. Tremendous amounts of money have spent for the importing petroleum products to Sri Lanka. Last year it was USD 50000 million and it counted as 50% of total import of the country.

42. However there are only two methods to obtain petroleum product in Sri Lanka. Those are importing refined product, import crude oil from petroleum producing countries and refine in Sri Lanka. The second option is much cheaper. Therefore second option is more suitable. This can be achieved by expanding Sapugaskanda refiner. The main advantage of newly design Sapugaskanda refiner is its content with new technologies which operate with very high

RESTRICTED

efficiently and effectively. After expanding refiner we can distil 90% of petroleum product requirement.

43. The other main challenge of CEB facing is high electricity cost. Low cost power generation can be achieved by introducing nuclear power plant in Sri Lanka. Though initial cost and technology is high to established nuclear power plant it can be recover by high capacity and low production cost.

44. Our government does not have proper solution if any energy crises happened in the world. We have not stored any amount of energy or petroleum product to face for any crises. Therefore it is time to think about energy storage facility in Sri Lanka to sustain any energy crises in the future.

CONCLUSION

45. In 1950s main energy requirement of Sri Lanka was for lighting and cooking. With the open economy concept in 1977 the demand for energy rapidly increased. Government introduced hydropower plant for generating electricity. Since hydropower was not sufficient to meet the requirement thermal power plant was introduced.

46. The main reason for daily price hike in crude oil is the less supply according to the demand of the international market. Middle East countries are minimizing their crude oil production due to the political crises in their countries. Western countries are trying to acquire the oil resources in the Middle East and African countries. And this results to minimize the supply of crude oil to international market. Some buyers keep the extra stocks and create an artificial

RESTRICTED

Shortage in the market. Above are several reasons that effect price hike in crude oil in the international market and in this makes our consumers to pay more for their oil..

47. The only refinery situated in Sri Lanka today contains only basic Petroleum Products. So we depend only on imported basic petroleum products. We can change this situation by modernizing our refinery and by producing basic petroleum products and it will be a more profitable investment. Likewise it will help to supply of oil continuously during any crisis. **And also will help to create a clever human** force.(delete)

48. Energy requirement of Sri Lanka mainly depends on imported petroleum products. . Petroleum products are decreasing day by day and it is estimated present petroleum in the world is sufficient only for few decades. Country's second largest electricity requirement is obtained by hydropower which depends on the climate of the country. Both the above facilities are not reliable sources. Though thermal electricity is short term plan, it requires huge amount of investment and production cost is very high.

49. Due to this reasons government has thought of introducing nuclear power plant in year 2030 as it is planned.

50.

51. **RECOMMENDATIONS**

52. According to the above studies it was found Sri Lanka is concerned of energy security. There are tremendous responsibilities for the government and people of Sri Lanka to overcome those challenges. To minimize those challenges the following can be recommended.

RESTRICTED

- a. To take expeditious action to complete expanding process of Sapugaskanda oil refinery.
- b. Take initiative to encourage people to activate possible and sustainable and renewable energy sources.
- c. Ensure implementation of the proposed new nuclear power plant by the year 2030.
- d. Ensuring to continue oil exploration in Mannar basin and expand it in other possible locations.

Trincomalee
07 Jun 12

YAR CHINTHANA
Lieutenant (E)
Student Officer

Distribution: The Commandant, Naval & Maritime Academy

Bibliography

Dr.Parag Divan, Dr AN Sakar Energy Security (Pentagon Energy Press, New Delhi 2009)

Dr. Tilak Siyambalapiyita, Energy policy review, The Island 2nd June 2011

Economic and Social Infrastructure, Central Bank Report 2011

Economic, price and financial system stability, outlook and policies Central Bank Report 2011

Economic and social infrastructure, Central Bank Annual Report 2008

Economic and Social Statistics of Sri Lanka 2011 Central Bank of Sri Lanka

F P Jerome, Sector Report Power Industry, Reviving of Sri Lanka power Sector 2010

Mr. L. Ariyadasa, Current Status of the Energy Situation in Sri Lanka

<http://www.info.energy.gov.lk/>

<http://www.ceb.lk/>

www.ceypetco.gov.lk/

Word Count: 3004