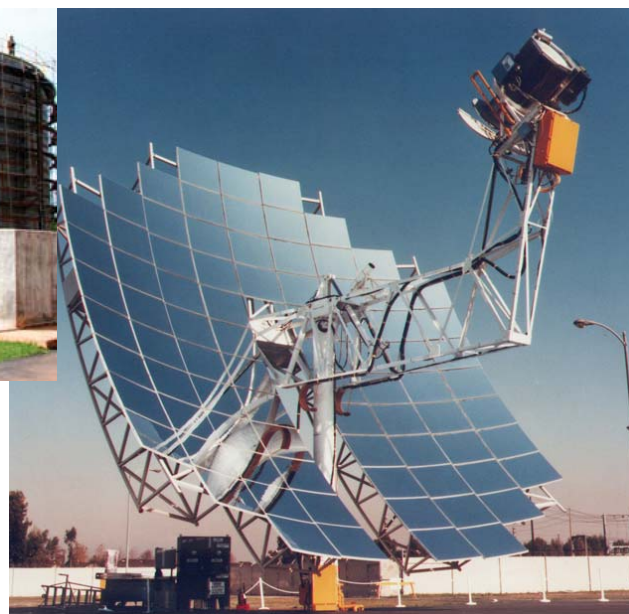


Energy Security

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Energy is very important for production of food for the mankind. We depend on energy for many of our day to day needs. Without energy, seed production, soil preparation, production of chemical fertilizer, production of pesticides, harvesting, post-harvesting, food processing, food preserving and transportation of food to populated cities will be impossible. Industrial sector also largely depends on energy. For construction of buildings and houses we need a lot of raw materials and goods. Most of these are produced at a distance and large amount of energy is used for transportation. When today's energy usage for consumption and existence per person is compared with the era previous to the industrial revolution, it is an 8 fold increase. (See table below)

In nature energy comes in different forms such as heat, sound, chemical, mechanical, magnetic, electrical and nuclear, etc. Energy sources are mainly of two kinds namely, renewable energy sources and non-renewable energy sources. Sun is the primary energy source and light and heat are the primary phases of it. Due to sunshine temperature changes occur in the atmosphere and in the ocean. Wind creates tidal waves. Wind energy originates due to the temperature variation in the atmosphere.

Ocean thermal energy and ocean currents originate due to the temperature variation in the ocean. In addition geo thermal energy accumulates beneath the earth surface. Hydro power is a renewable energy source which we are using at the moment. Tidal energy and bio fuel too can be used. When solar energy cannot be tapped we can use these renewable energy sources.

Era	Daily energy consumption				
	Food preparation	Agriculture	Industry	Transport	Total
Primary man (Before one million years)	2				2
Hunting man (Before hundred thousand years)	3	2			5
Primary Agriculture man (B.C. 5000)	4	4	4		12
Developed Agriculture man (B.C. 1400)	6	12	7	1	26
Industrial man (From 1875)	7	32	24	14	77
Technical man (From 1970)	10	66	91	63	230

Renewable energy sources are widely distributed, and collecting and conserving this energy is important. After the discovery of non-renewable energy sources, it was used efficiently, resulting in the evolution of the industrial and technical eras.

Fossil fuels such as coal, petroleum and natural gas are non-renewable source of energy. Coal is a solid fuel formed over millions of years by the decay of terrestrial vegetation. Oil and natural gases are formed from the remains of marine microorganisms (microscopic animals and plants) deposited on the sea bed. Fossil fuels are found in deposits beneath the earth in limited reserves. Nuclear energy is the other non-renewable source of energy which man has developed, and is being used at risk.

The present energy consumption pattern clearly shows that societies totally depend on fossil fuels. But due to the limitations of fossil fuel and the consequent threat to society we have to seriously think about the future energy security concerns.

Threats due to Liquid oil and natural gas depletion

Depletion of liquid oil and natural gas deposits is the first and the foremost challenge to dependency on fossil fuels. Present society depends totally on petroleum. Since the 1980s mankind has been using fossil fuels in excess of what is extractable. Major oil producers are aware of the depletion of fuel, and have been trying very hard to find new fuel deposits without much success. Specialists in the field predict that the period 2010-2012 will see the peak in fuel consumption (see graph 2). Therefore the present society should find the means for ensuring energy security for the future without totally depending on fossil fuels.

Challenge of global warming

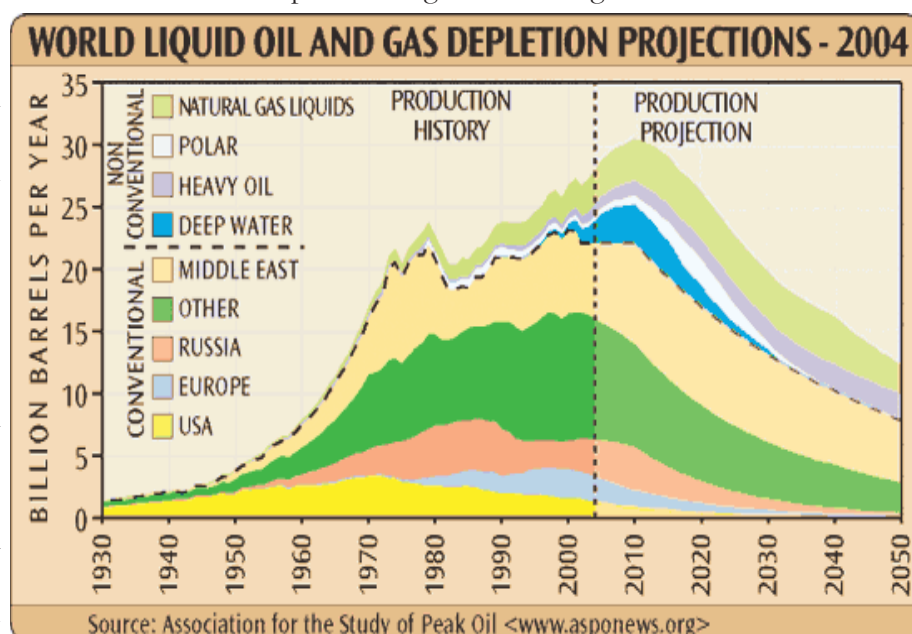
The second challenge which mankind has to face in relation to energy security is global warming. Global warming is due to the burning of fossil fuels, mainly coal.

For ages the earth's cooling process resulted in depositing its element carbon as fossil fuel beneath its surface. But in recent times mankind has released enormous amounts of carbon to the atmosphere by burning this fossil fuel which was hidden underground. As a result last decade became the hottest decade. Among the fossil fuels, coal is the major contributor to global warming. Today we are unable to stop this rise in temperature. According to predictions, by the 2013 summer, all the ice peaks in Antarctica will disappear releasing water to the ocean. By year 2050 carbon emission should be reduced by 50% of the baseline year 1990.

Potential of fossil fuel in Sri Lanka

When we talk of energy security in Sri Lanka special attention should be paid to the fact that still Sri Lanka does not have an assurance of a fossil fuel deposit. Investigations are on with the hope that we will achieve the energy security for Sri Lanka by this process.

We should remember that it may take at least 10 years to get a confirmation about the availability of a fossil deposit through this investigation. In fact even with an



accelerated investigation programme it will take 7 years. Therefore we cannot expect a quick/instant solution for energy security for Sri Lanka. According to the predictions by experts in the field, we could get a fossil fuel supply of one billion barrels. When compared to the present level of energy consumption this will be sufficient for only 30 years. However, if we consider the

current increase in demand for energy consumption, the deposit will be over in 13 years. Since Sri Lanka is not in a position to spend a large amount of money on this project, and has to seek foreign investments from oil companies, this will again reduce our share of the oil even though the deposits belong to us, and consequently our ultimate objective would not be fulfilled.

When considering Sri Lanka's energy security, we should remember and concentrate on our energy necessities. Otherwise we will have to always depend on other countries and face difficulties with world economic fluctuations.

Even though we lack fossil fuels, being a tropical country we are very rich in renewable energies sources.

Sun shine throughout the year, high growth rate of trees, monsoon winds, ample hydro energy are some of them. On the other hand, being an island we have the ocean with its rich energy resources. Since the southern part of the ocean does not have any major land masses up to the southern pole, we have a high potential for use of steady sea waves and winds.

Although we have ample renewable resources, have we made optimum use of these resources? Thanks to Mr Wimalasurendra's` farsighted vision, Sri Lanka has been able to exploit the country's hydro power potential. Presently we have 1325 mega watt of hydro power. In 1995 100% of the electricity demand was fulfilled by hydropower generation. But unfortunately so far the Ceylon Electricity Board (CEB) has not been able to harness any other local energy source. They were concentrating on coal power for the last 20 years, and

as a result government is now taking steps to build a 1400Mega watt coal power plant. CEB also targets to establish another coal power plant of 3300Mega watt by year 2020. Undoubtedly this is an unfortunate situation for our country.

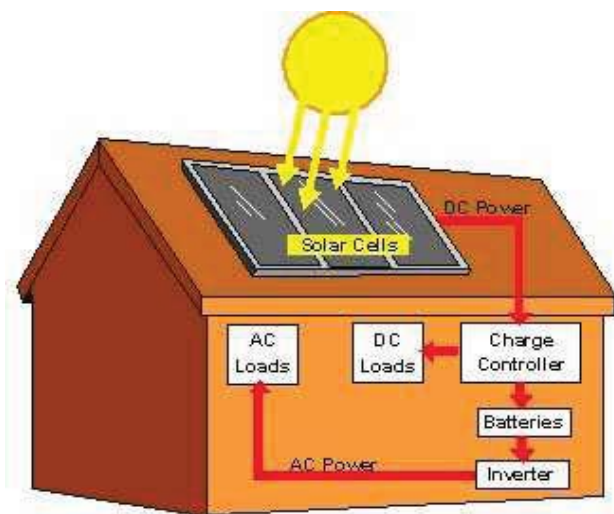
Essential components for Energy Security

CEB has been using various hypotheses for their long term power generation plan. A basic weakness of these is the inadequate attention paid to the key factors of energy security. The CEB has been always recommending import of fuel from foreign countries, and to establish coal power stations in Sri Lanka. This aspect needs an in-depth review.

Hypothesis I: Electricity demand will continuously increase with a rate of 7-10% throughout the next 20 years.

CEB believes that the strategies of energy conservation and the financial crisis due to the ending of a fossil fuel era will not affect the Sri Lankan electricity demand for the next 20 years. This shows a lack of understanding about the concepts of energy conservation.

Hypothesis II: For Electricity generation, coal plant, petroleum fuel and hydropower are the only alternatives.



The assumption that renewable energy sources such as fire wood energy, wind power are not suitable is not acceptable, and by doing so they have totally ignored using local resources for energy security.



Hypothesis III: Liquid oil and Coal prices will not increase during next 25 years.

For calculations of long term power generation plans, the future discount rate has been taken as 10%. By this assumption it has been shown a lower present value for a future expenditure. When using discounting principle the general practice is to estimate the increase of future expenditure parallel with depreciation. Therefore, the above hypothesis is not realistic. This pays injustices to renewal energy sources which has a high capital value with low recurrent cost. On the other hand, it gives undue favour for costly liquid oil and coal plants.

Hypothesis IV: For calculations of expenditure, there is no difference between local and foreign expenditure.

Local expenditure is a circulation of money within the country while import expenditure money goes out of the country. Therefore, import expenditure will directly influence the foreign currency reserve. For instance, when we purchase coal for power plants, it depletes our foreign currency reserve, but if we purchase fire wood from our villages money will go to the poor rural farmers. Due consideration should be paid to this factor.

Hypothesis V: Foreign exchange rate will be constant.

This is clearly wrong. In general rupee value is depreciating. However, assumption of constant foreign exchange rate for the next 25 years will not reflect the real price of the coal and liquid oil.

Hypothesis VI: Lifespan of a hydropower plant is 20 years.

Hydropower plants are functioning efficiently for more than 50 years in Sri Lanka. Therefore the above hypothesis is unjustifiable.

Hypothesis VII: Improving problematic climatic changes and other environmental changes will not affect generation expenditure.

This is a wrong concept. Carbon trading directly influence the net expenditure. If these calculations are added, the net cost of coal will be rapidly increased.

Hypothesis VIII: No difference between central and decentralized power plants.

Coal power plants are centralized plants, while renewable energy sources are decentralized by nature. Therefore, benefits of decentralized plants will go for renewable energy sources while disadvantageous of centralized plants will go to coal plants.

For centralized plants, large capacity transmission systems are required, which involves high capital expenditure, while there is also a high distribution loss. For decentralized systems this is not a problem and even by-products of the plants can be used for other industries. Unfortunately CEB does not see the difference between centralized/decentralized power plants.

To give proper attention to energy security, it is essential to achieve an attitudinal change. Change of attitude should not be limited to only for electricity but for all the other power sectors as well. Electricity is only one such example. In the fields of transport, industry, construction as well as household activities, there should be a similar attitudinal change. It is disappointing to note that while the entire society is moving forward, attention towards energy security is moving in the opposite direction.



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