

'Thoughts on Conscience'



"There is a higher court than court of justice and that is the court of conscience. It supercedes all other courts"

- M.K. GANDHI

"The conscience is the most flexible material in the world. Today you can not stretch it over a mole hill; while tomorrow it can hide a mountain"

- Edward G. Bulwer Lytton

Indian Rebellion of 1857/First War of Indian Independence Part of Indian independence movement



Gandhiji writes at one point that every movement passes through five stages.

First, the authorities **ignore** it.

Then they try to **laugh** it away.

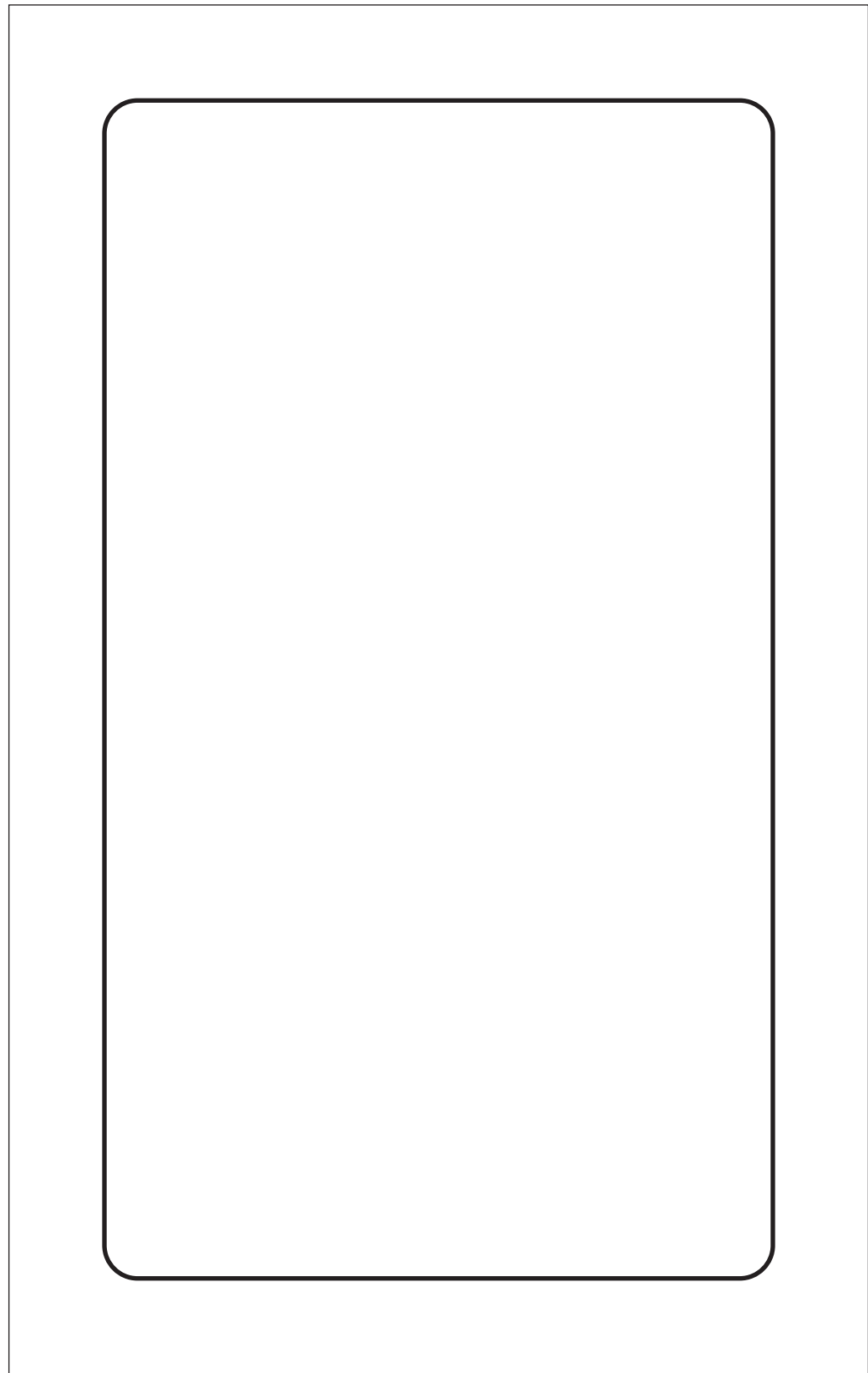
Then, as it doesn't go away, they **denounce** it.

As that too does not work, they seek to **crush** it.

Having persevered through each of these with its prophecies coming true, the movement comes to **command respect**- which he says, is another name for **success**.

We are sure that we will certainly succeed in our national mission to make India

Energy Independent by 2022



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(S. K Sood)
President, IAEMP

PREFACE

The Govt. of India has projected a need for Rs 9,00,000 crores in 10th and 11th five year plans for fresh capacity additions and to meet the cost of renovation and modernizing the existing electricity transmission and distribution network. State governments and the private sector will probably spend an equal amount to increase their power generation capacity. Other Central government ministries like Ministry of Petroleum & Natural Gas and Ministry of Coal, etc will also be spending huge amounts to meet energy requirements of the country.

It seems we will need a whopping Rs. 50,00,000 crores in the next 8-10 years to meet our energy requirements. This is in addition to the expenditure on creating infrastructure to transport energy such as the railways, shipping etc.

Imagine the amount of money, which must have been spent since independence. Are we not hugely subsidizing the so-called conventional energy sector? And even after spending such huge amounts what have we got or are going to get in return? Same power cuts, power thefts, and poor quality power, ever-increasing power and fuel bills, problems caused by pollution? And will our villages get sufficient power and fuel? As per 'Census 2001' figures, 56% of the rural households do not have access to electricity. As per another report, 35% of world population without access to electricity is in India (about 58 crores). As far as fuel is concerned, our villagers are still relying on age-old firewood, cow-dung, etc.

The fact that remains in the end is - like other walks of life, energy sector also has its "haves" and "have-nots". People propagating energy efficiency and renewable energy technologies belong to the later category.

We have been spending about 30 % of our budget to meet the energy requirement. Our net import bill for petroleum products has already crossed Rs. 1,80,000 crores. Our dependence on imported petroleum has gone up to 75%. Even more worrying is the fact that coal imports have gone up to 20%, which is supposed to be available in abundance in our country. Thus, there is a serious threat to our energy security, which may even endanger our national security.

A serious look into the whole matter will reveal that we need to take hard decisions on our energy policy, if any. Presently, lakhs of people are involved in generation, transmission and distribution of electricity, petroleum products, coal, etc., And in comparison, the involvement of people in conservation of energy and generation of

renewable energy is much less. The fact that remains in the end is - like other walks of life, energy sector also has its “haves” and “have-nots”. People propagating energy efficiency and renewable energy technologies belong to the later category. Of course, within the “haves”, there are “have-nots” and within the have-nots,” there are “haves”! The Energy Efficiency and Renewable Energy (EERE) sectors can provide jobs with much lesser investment but unfortunately, this aspect has not been well understood and the policy makers seems to be confused about what exactly is required to be done.

There is huge potential of creating employment and business in EERE sectors. Implementation of “The Energy Conservation Act” 2001”, “The Electricity Act, 2003” and “The Renewable Energy Plan-2012” in the right earnest will provide the much needed thrust. “The National Building Code-2005” brought out by The Bureau of Indian Standards has also come as a timely help since it gives, for the first time due importance to incorporation of concepts of energy efficiency, water recycling and rain water harvesting.

Since India achieved political independence, the country has developed capabilities to safeguard its sovereignty and the life and liberty of its people with minimum dependence on external agencies. The green revolution of the 1960s has brought about food security to shield people from hunger and famine. Energy Independence, however, has been lagging behind.

There has been some confusion about the concepts of energy security and energy independence and frequently the two concepts are used interchangeably as if they were synonymous. But they are not. Energy security is the simpler concept and means that a nation has at its command entirely from indigenous sources all the energy its citizens require for carrying out their defense, governmental, industrial, and domestic activities. No foreign nation or government can interfere in any manner in the availability of that energy supply.

Energy Independence involves the concept of the ability to operate on an approximate self-reliance basis, but with not enough reduction to affect the mainstream of economic activity. It does not preclude relying to a moderate degree on foreign sources, which might be cut off. But the existence of the status of independence would obviously reduce to a major degree the likelihood of the withdrawal of such foreign supply. Almost everyone agrees that achieving Energy Independence is quite possible

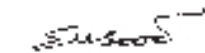
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in India despite the present dismal scenario.

In his customary address to the nation on the eve of 59th Independence Day on 15th Aug, 2005, the then President Dr. A.P.J. Abdul Kalam, had issued a timely warning on relying on foreign help to achieve energy security. He had emphasized the need for launching of an integrated mission to achieve “Energy Independence” by the year 2030. He also suggested the time bound action plan for achieving the goal. His address has been a great source of inspiration for us.

Inspired by the call of Dr. Kalam, a group of enthusiastic and committed energy management professionals from all over India decided to come together under the banner of “Indian Association of Energy Management Professionals”(IAEMP). The mission of IAEMP is to work for achieving India's Energy Independence by the year 2022, the year when we will be celebrating 'Platinum Jubilee' of our political independence. Thus, our group is trying to achieve the target 8 years before 2030, the year by which India's “Energy Independence” is possible as envisaged by Dr Kalam. We are aware that this is a tall order but certainly not out of reach considering our vast human & natural resources. It is a happy coincidence that the year 2007, (the year when we have launched this vision document) also happens to be the 60th anniversary year of our political independence as well as 150th anniversary year of first war of Indian Independence of 1857.

This document also includes recommendations of “Integrated Energy Policy-2006” prepared by Planning Commission and “New & renewable Energy Policy Statement-2005” prepared by Ministry of New & Renewable Energy as well as suggestions of Dr. Kalam. Thus, an attempt has been made to prepare a comprehensive workable plan, which if implemented in right earnest can surely make our country 'Energy Independent' by 2022.


(S.K.Sood)
President, IAEMP

With inputs from :

Prof. Ajay Chandak, Mr. G.G Dalal, Mr R.V Ramana Rao, Mr. Sunil Biswal,
Mr. S.P. Nanda and other members of IAEMP & NPC Yahoo group

CHAPTER-1

History of Energy Efficiency & Renewable Energy Sectors in India

1.1 Background

Although the concepts like energy conservation, non-conventional energy sources had emerged way back during the time of the First World War, these concepts were first taken up seriously in India only after the oil price shocks in 1970s. A number of steps were taken by the central govt. to contain the rapidly rising bill on import of petroleum products. The chronology of events which took place since then is summarized below:

- | | |
|--|--|
| <p>1976 : Formation of Petroleum Conservation Research Association (PCRA) to encourage conservation of petroleum products.</p> <p>1981 : Setting up of Inter-Ministerial Working Group (IMWG) in 1981 to identify energy saving potential in the country.</p> <p>1981 : Setting up of Commission for Additional Sources of Energy (CASE) for the development and promotion of renewables.</p> <p>1982 : Department of Non – Conventional Energy Sources (DNES) established under ministry of power(MoP).</p> <p>1983 : Inter-Ministerial Working Group(IMWG) set up by the Government to identify energy saving potential in the country submitted report-identifying energy saving potential of 20%, 25%, &30% in transport, Industrial & Agricultural sectors respectively .Domestic sector was not covered.</p> <p>1987 : Indian Renewable Energy Development Agency Limited created to provide financing mechanism for renewable energy projects/ systems.</p> | <p>We need to appreciate the importance of History. A careful study of historical developments in any field can keep us from re-inventing the wheel again and again.</p> |
|--|--|



1989 : Energy Management Center (EMC) established under MoP

1992 : The Ministry of Non-conventional Energy Sources (MNES) created by separating the erstwhile DNES from MoP. (This Ministry was renamed as Ministry of New and Renewable Energy in Oct 2006)

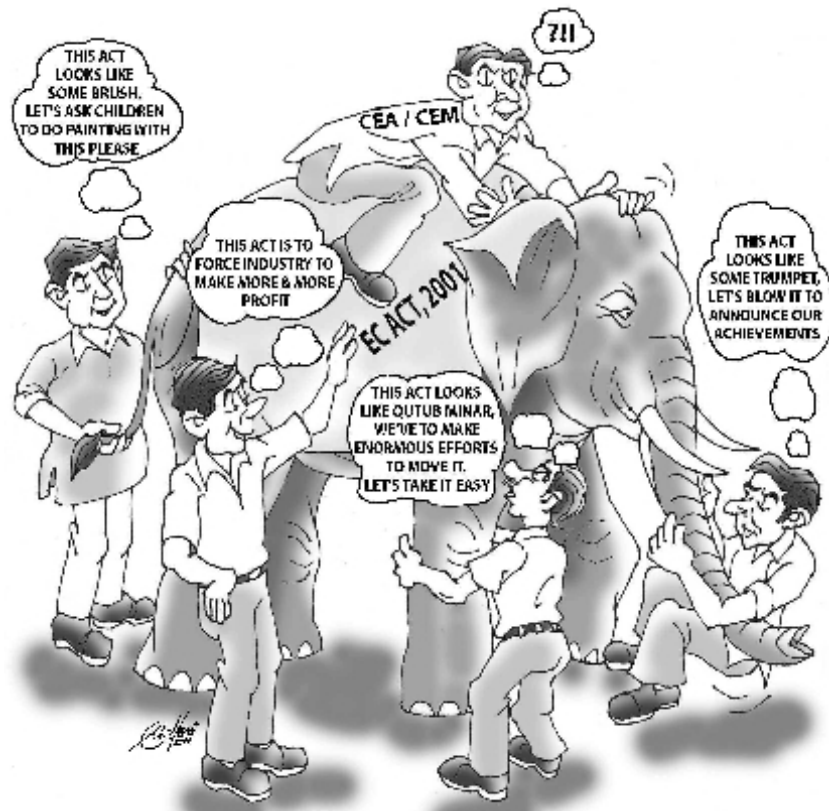
Finally, the Energy Conservation Bill was introduced in the parliament in the year 2000 & was enacted as "The Energy Conservation Act 2001" on 29th September 2001. (Exhibit-A) Subsequently on 1st March 2002, the Bureau of Energy Efficiency (BEE) was established & given mandate to implement the provisions of the act.

Earlier, in the 80s & 90s, a number of steps had already been taken to encourage Energy Efficiency & Renewable Energy (EERE) in the country, such as:

- Making it mandatory to include a statement in the Annual Reports of the companies on energy consumption figures & steps taken to bring down the specific energy consumption
- Introduction of Fiscal Benefits.
- State level nodal agencies were formed to encourage use of renewable energy technologies as well as to promote energy efficiency.
- Energy research centers and school of energy studies started by few universities.
- Various international co-operation programmes like Indo-European Community Project, Indo-German Project, EMCAT Project etc. were taken up.
- Many Engineering Colleges/Universities started post Graduation courses on Energy Management.

Organisations like National Productivity Council (NPC), Tata Energy Research Institute, (now, The Energy & Resources Institute) and International Energy Initiative and others, contribute in a great way to provide technical competence & training to Engineering Professionals.

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Industry Organisations like Confederation of Indian Industry (CII), PHD Chamber of Commerce & Industry and alike, started their own energy conservation cells.

Various manufacturers' associations of energy intensive industries started training their employees on energy management techniques & switched over to energy efficient processes & technologies. Manufacturers of energy efficient Equipment & systems also contributed by bringing in more efficient designs & systems to the market. The manufacturing base of wind energy and solar energy also increased many folds.

The energy consultancy firms in the private sector also contributed to a great extent by popularizing the concept of energy Audits. The subsidies provided by state level nodal agencies like Gujarat Energy Development Agency Ltd (GEDA); Madhya Pradesh Urja Vikas Nigam Ltd (MPUVN) helped the energy consultants in getting assignments by motivating the Industrial units. Various capacity building programmes launched by American, German & other International agencies helped the energy consultants to improve their technical capabilities:

India was fortunate to have leaders like Gandhiji, Pandit Nehru, Sardar Patel, to achieve political independence. The same kind of leadership is needed to achieve energy independence.

1.2 The reasons for slow progress of EERE:

The history of energy efficiency & renewable energy programmes in India is now more than 30 years old. A close look into the various activities carried out by different agencies reveals that, while a lot of efforts have been put in, corresponding results have not been achieved. The main reasons for this could be:

- Gross under-pricing of the polluting energy by non-inclusion of the environmental damage repair costs, for which economists of the whole world are to be blamed
- Political interference to ensure free electricity, and subsidies on LPG, Kerosene, Diesel etc.
- Preferential treatment to the lobbies of Power and Oil sectors
- Non-existence of long-term policies at National & State levels
- Lack of interest on the part of Electricity Boards to encourage EERE

- Double Standards of Oil companies (i.e. aggressive marketing of their products on one hand and celebrating 'Oil Conservation Fortnight' on the other)
- General apathy of the public & professionals about EERE concepts.
- Lack of Top-level awareness and commitment.
- Inadequate allocation of Funds and Resources.
- Failure of all to realize the full potential of Solar Thermal devices for low grade heating purposes.(Water Heating & Drying)
- Failure of Govt agencies and banks to implement soft loan schemes of MNRE. MNRE is itself to be blamed for its half-baked schemes.
- Reasons attributable to Energy Consultants like lack of expertise, commitment and professionalism.
- Half-hearted implementation of 'The Energy Conservation Act,2001' 'The Electricity Act, 2003'. (amended in May 2007, Exhibit-B)
- Lack of co-ordination amongst govt. agencies.
- Prevailing socio-economic reasons, consumerism, non-merit subsidies and corruption
- Too much of departmentalization and too many ministries killed the development of EERE. These departments and ministries have conflicting interests. On one hand petroleum ministry subsidies LPG and kerosene while MNRE is reducing the subsidies on their technologies. On the other hand Gadgets like solar water heaters are taxed at 4%. Transport ministry is putting very high stress on road construction, which will favor oil imports, while the most preferred and cheapest transport sector like railways is extremely slow on capacity addition. This sector runs on electricity (coal) which will not likely to face the same price rise as that of oil.

We have to learn lessons from our past mistakes and ensure that we don't make new mistakes. Therefore, while planning for implementation of energy efficiency and renewable energy programmes/policies, we have to see that all the necessary steps have been taken. Due recognition to those who have shown total commitment to the cause must be given. There are consultants and other activists who dedicated their life to the cause but remain unknown and unheard of because they don't occupy the right chairs.

While MNRE provides soft loans for purchase of solar water heaters, at the same time, the state governments levy 4% VAT on this product.

CHAPTER-2

A Road Map to “Energy Independence”

2.1 The Path followed Till Now

The time is running out for us to take immediate, medium and long term measures against unprecedented energy crisis, which threatens our national safety, economy, and way of living. The voluntary approach for conservation in the use of energy has proven ineffectual and the supply-demand picture has been deteriorating so that some sort of decisive action has become imperative.

We Indians are becoming spoilt and the adjustment to a more rigorous life is getting more and more painful. The voluntary conservation program is not working for a simple reason; a slight misunderstanding let us say; everybody is volunteering his neighbour to save energy, but not himself. Voluntary programs of any kind make good rhetoric but poor economics.

Some get free power, some are allowed to steal, some are subsidized, some consume recklessly due to their money power, many use in-efficiently and the rest are made to bear the burden.

A country cannot be run for long by appealing to the patriotic feelings of its citizens. It has been tried before, without success, in the areas of spending, saving, foreign investments, to name a few. It has always failed. Indeed, time tested economic theory says that it is destined to fail. Today Indian tourists are spending 5 times more than the foreign tourists spend in India! Also, Indians are investing more abroad than they are doing so in India!

The truth is, higher prices are the only long-term conservation tools that will work, and we might as well get prepared for it. Moreover, higher prices will redirect our research efforts into what are at present prohibitively expensive alternative energy sources

The energy crisis is not the result of an overnight action. Rather, it is the result of a long chain of misguided policies leading to wasteful use of oil and power and too much reliance of foreign oil rather than developing domestic supplies. The abysmal failure of power policy has led to overshadowing the whole country by erratic power supply & desperate power cuts, which is throttling the economic activities in the country. Some get free power, some are allowed to steal, some



are subsidized, some consume recklessly due to their money power, many use in-efficiently and the rest are made to bear the burden. Neglecting the cost of failure & delayed power are too costly for the economy of the country.

Most of the persons who have been involved in implementation of various schemes of the Government agencies to promote the concept of Energy Efficiency & Renewable Energy, feel that there is a need for free and frank discussion on the path followed till date to realize the benefits of energy efficiency and to effectively utilize renewable energy sources. Have we followed the right path till now? Have we learnt lessons from the past experience? Why are countries like Japan are more energy efficient than us?

The architects of the Energy Conservation Bill which became an Act in Sept.2001, would have certainly considered all those points while drafting “The Energy Conservation Act,2001” (EC Act,2001) Passing of the Act had raised lot of hopes that soon the voice of conservationist will be heard and accepted. But a look at the progress made till now gives a very discouraging picture.

Except for few provisions e.g. clause 13(2c), 13(q), 13(r) , 15 (d) and to some extent clauses 14 (h) nothing worthwhile has been done in the last years. However, the web site www.energymanagertraining.com has been doing excellent work to promote energy efficiency. In fact, most IAEMP members are products of this site.

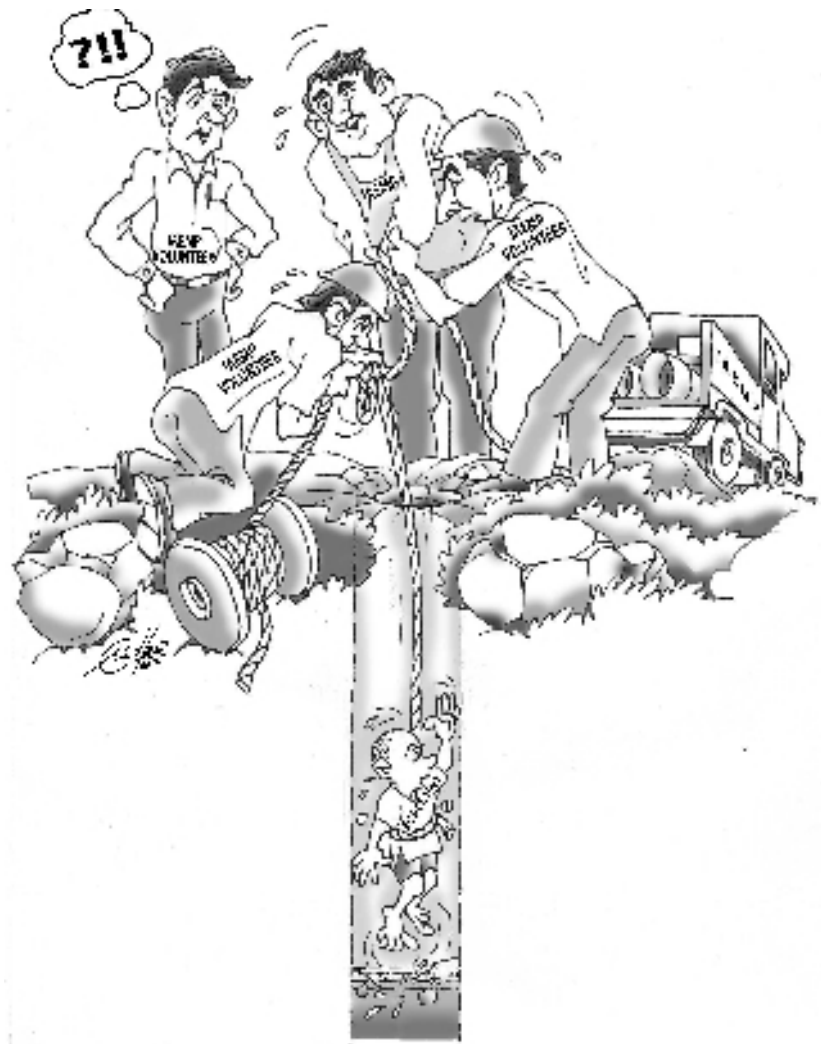
Another useful law, “The Electricity Act, 2003’, is also waiting for its implementation in letter & spirit. The Act has been recently amended vide The Electricity Amendment Act, 2007 and notified on 29th May 2007.

Not much is known about the real progress of “The Renewable Energy Plan-2012” launched by the then Ministry of Non Conventional Energy Sources (now MNRE). In the absence of independent validation agencies, the claims of MNRE can not be relied upon

2.2 Multiplicity of Agencies and schemes

Presently, various agencies are implementing energy conservation / efficiency and renewable energy programmes .For example, PCRA has its own programmes divided into 4 categories i.e. Industry, Transport, Agriculture & Domestic Sectors.

There is a need for free and frank discussion on the path followed till date to realize the benefits of energy efficiency and to effectively utilize renewable energy sources.



IREDA has its own schemes for financing the EERE project. MNRE and State nodal agencies like GEDA, MEDA, MPUVN, KREDL etc. have also several schemes of their own. EMC (now BEE) was operating its own international programmes.

The programmes & schemes of almost all the agencies are not very attractive for the ultimate beneficiary of such schemes. Either the lengthy & complicated procedures, or the terms of loans/grants make them unviable. Finally, only a few projects are taken up. Successful cases, which have been implemented, are rarely given proper publicity & the details are not made available to the interested parties, which could have promoted energy efficiency, by the multiplier effect.

The active involvement of State Electricity Boards (SEBs) on ESCO route could have made a huge difference but they are least interested in starting any energy efficiency programmes due to the wrong notion on their part that it does not make economic sense to save electricity in the higher tariff consumers while low (or nil) tariff consumers have no money to invest in energy efficiency measures. Even the mandatory purchase of electricity from renewable energy sources under the Electricity Act, 2003, is viewed by SEBs as some sort of nuisance.

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2.3 Suggested Road Map

Based on the experience of almost all the IAEMP members and that of several others in this field, the following road map is suggested to achieve "India's Energy Independence"

2.3.1 Formation of "Ministry of Energy Efficiency & Renewable Energy"

Imagine that we have to wage a war against an enemy who is out to destroy us. Can we have the three wings of Defense Services under different ministries? Army, under Ministry of Surface Transport; Air Force under Ministry of Civil Aviation; and, Navy under Ministry of Water Transport. Can we then win a war

against the enemy? Well, it might be too exaggerating to draw an analogy in this manner with war against energy inefficiency but that is what is happening in the field of energy efficiency and renewable energy. Different agencies that need to work together have hardly any co-ordination amongst themselves.

Bureau of Energy Efficiency is under Ministry of Power, whose primary mandate is to plan for addition of new power generation capacities. Petroleum Conservation Research Association is under the Ministry of Petroleum & Natural Gas whose primary job is to plan for exploration, production and distribution of Petroleum and Natural Gas. Similarly, other agencies are having their own primary objectives. Ministry of Coal is not taking any interest in EERE sector. Only the Ministry of New & Renewable Energy (MNRE) has the mandate to promote RE. But its functioning is made in-effective due to domination of the power and petroleum lobby.

Considering the above problems of too many agencies i.e MNRE, IREDA, PCRA, BEE etc and state level nodal agencies it would be very appropriate to form a single ministry at both central and state level governments. This ministry may be called the “Ministry of Energy Efficiency & Renewable Energy” (‘MEERE’) and all the present agencies may be merged in the new ministry. It would be really effective if it is directly under the Prime Minister.

Formation of ‘MEERE’ would have several benefits like better and more effective utilization of human resources and funds, elimination of delays due to lack of co-ordination, elimination of conflict of interests, elimination of administrative delays. The biggest benefit will be by way of improved functioning of state nodal agencies which are presently working in a most unorganized manner. The rampant corruption in the functioning of state nodal agencies can also be minimized this way.

This step may take some years to implement. Till such time, the ‘Energy Commission’ working directly under the Prime Minister, can be appointed for improved functioning of aforesaid agencies.

2.3.2 Follow-up with other Ministries

Several provisions of the EC Act, need rigorous follow-up with the concerned ministries. For example, Energy

Formation of a single ministry by merging together all agencies working in EERE sector at central and state level is the need of the hour. The sooner it is done, the better it is for the country.

Conservation Building Code and National Building Code-2005, Innovative financing of Energy Efficiency project, Preferential treatment for Energy Efficient Technologies etc.

Actually there is no ministry which has no role to play in achieving the “Energy Independence” since all their decisions /actions / plans etc ultimately affect the energy consumption. Detailed list of points which affect the energy scenario needs to be prepared for each ministry and taken up with them /with the PM for necessary corrective actions.

2.3.3 Expanding BEE and opening of State level offices

The present strength of BEE is too miniscule to handle implementation of the Act. With a strength of just 10-12 persons sitting at New Delhi, it is impossible for BEE to do justice to the spirit of the Act. BEE cannot totally depend on Designated Agencies at State Level. Sincere implementation of the Act will need dedicated energy efficiency and renewable energy experts at state level. BEE must open offices in all the state capitals as well as in major industrial towns and district headquarters.

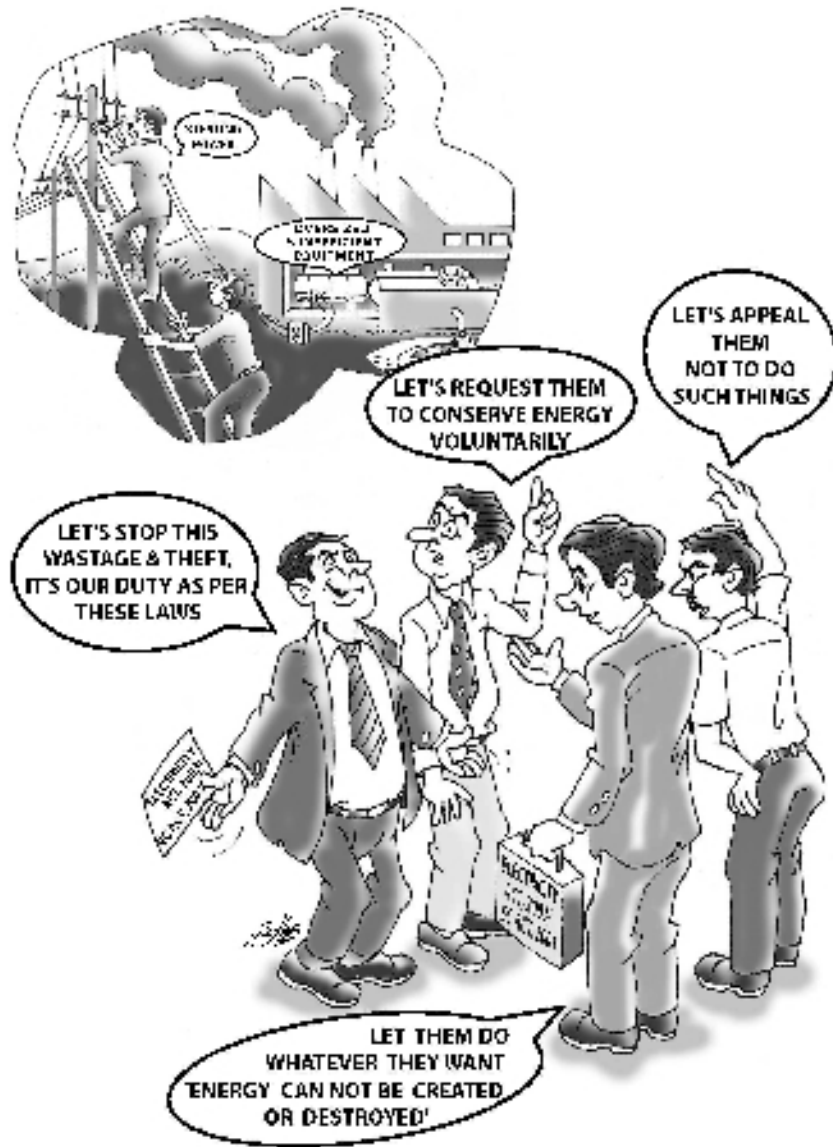
2.3.4 Changing Approach for implementation of “the Energy Conservation Act, 2001”

Presently, the Act is being projected as a tool to “force the companies to make more profit”. Considering the human mentality, the voluntary approach being adopted will not serve any purpose. Using energy inefficiently is a crime under this act and it should be projected as such.

The greatest tragedy of the country is that none of the worthy potentials of ‘The Energy Conservation Act, 2001’ have been utilized so far even after more than 6 years of the Act coming into force. The proponents of the voluntary approach have totally overlooked and diluted the very basis on which the EC Act was conceived and passed by the parliament. The recent notification of the Ministry of power proves this point (Annexure -1)

The voluntary approach has never succeeded in any country. Even in Japan and Germany strict laws were needed to force people to adopt energy efficient ways.

The laws are enacted for enforcement, not for voluntary adoption. If auditing of accounts was not made compulsory, how many companies would have opted to get their accounts audited?



2.3.5 Involvement of CEA/CEMs in implementation of "the Energy Conservation Act, 2001"

District level EERE officers need to be appointed by BEE out of the CEA/CEMs. They can also be utilized for helping BEE for implementation of the following provisions of the Energy Conservation Act 2001:

- Dissemination of information (clause – e, section 13)
- Conducting Training Programmes (clause – f, section 13)
- Strengthening of Consultancy Services (clause – g, section 13)
- Promoting R & D (clause – h, section 13)
- Providing feedback and follow-up services (clauses – d, k and n, section 14)
- Conducting mandatory audits for government departments and establishments.

2.3.6 Active support for proper implementation of relevant Acts and Plans

Other relevant Acts like 'The Electricity Act, 2003' and 'Renewable Energy Plan-2012', 'Clean Development Mechanism', and other plans of Ministry of environment & Forests need to be actively supported.

2.3.7 Educating the media/legal experts/architects/consultants/politicians

The public in India remains generally unaware of the serious nature of energy situation, mainly because of the complexity of the subject and also because the news media-source of most of the public's information have done an extremely poor job of interpreting events related to energy supply, demand, and cost. Hence, instead of the direct approach, it will be better if intensive educative programmes are started for media persons/legal experts/architects/consultants/politicians etc.

The news media-source of most of the public's information have done an extremely poor job of interpreting events related to energy supply, demand, and cost.

It is observed that because of intervention of different courts the subjects like environmental engineering and renewable energy are introduced in the schools and colleges and it failed to deliver the expectations. These are still treated as additional burdens. In addition

to theory subjects practical for the subject needs to be added to give the feel of technology.

2.3.8 Assisting NGOs, research organisations for promotion and development of new technologies.

Huge funds are spilled over futile research especially in renewable energy area in many government funded academic institutions and research organisations. There is no accountability towards deliverables against the funding provided for such research and promotional works. NGOs and research organisations of repute can have far reaching impacts as against the government and academic organisations.

2.3.9 Involvement of professional organisations and NGOs in policy framing:

Economics has to be the basis of policies framed for promotion of EERE. Non viable technologies even if pushed with big subsidy schemes, finally brings bad name to the technology and bring lot of confusion amongst common people. Professional organisations, associations like IAEMP and NGOs can assist in framing policies on EERE.

2.3.10 Implementations of the recommendations given in “Integrated Energy Policy-2006”:

The Integrated Energy Policy-2006 prepared by Planning Commission is an excellent document. Most of the recommendations must be implemented without any delay.

2.3.11 Implementation of Dr. Kalam's suggestions

In his customary address to the nation on the eve of 59th Independence Day on 15th Aug, 2005, the then President Dr. APJ Abdul Kalam, had issued a timely warning on relying on foreign help to achieve energy security. He had emphasized the need for launching of an integrated mission to achieve “Energy Independence” by the year 2030. He also suggested the time bound action plan for achieving the goal. His suggestions need to be taken due note of and implemented with right earnest.

2.3.12 Formation of Energy Protection Force.

It is recommended that like other security agencies, working for maintenance of law and order, an Energy Protection Force (EPF) be formed. EPF can be effectively utilized to prevent pilferage and theft of energy.

CHAPTER-3

Rational Use of Energy & Demand Management

3.1 Are we heading towards a more serious crisis- 'Entropy Crisis'?

Energy is defined as the capacity to do work and entropy is the negation of that capacity. Energy of a system is the potential ability to do work & entropy is the potential inability to do that work.

The law of entropy, which is one of the greatest discoveries of the human mind, states that whenever a system does work, unless it is an ideal reversible work, its entropy increases & its potentiality for further work decreases. This is true for all systems- from the non-living world to all living organisms, including man & his society.

As man continues spinning around more and more of his demands for the so-called needs – redundant needs of goods and services-needs which were not in his mind but inflicted artificially from outside 'sales, services and shows', he gets trapped into all kinds of methods and machines.

As a result all kinds of metals and materials, cakes and cans, tools and toys make deep inroads in his life and living processes.

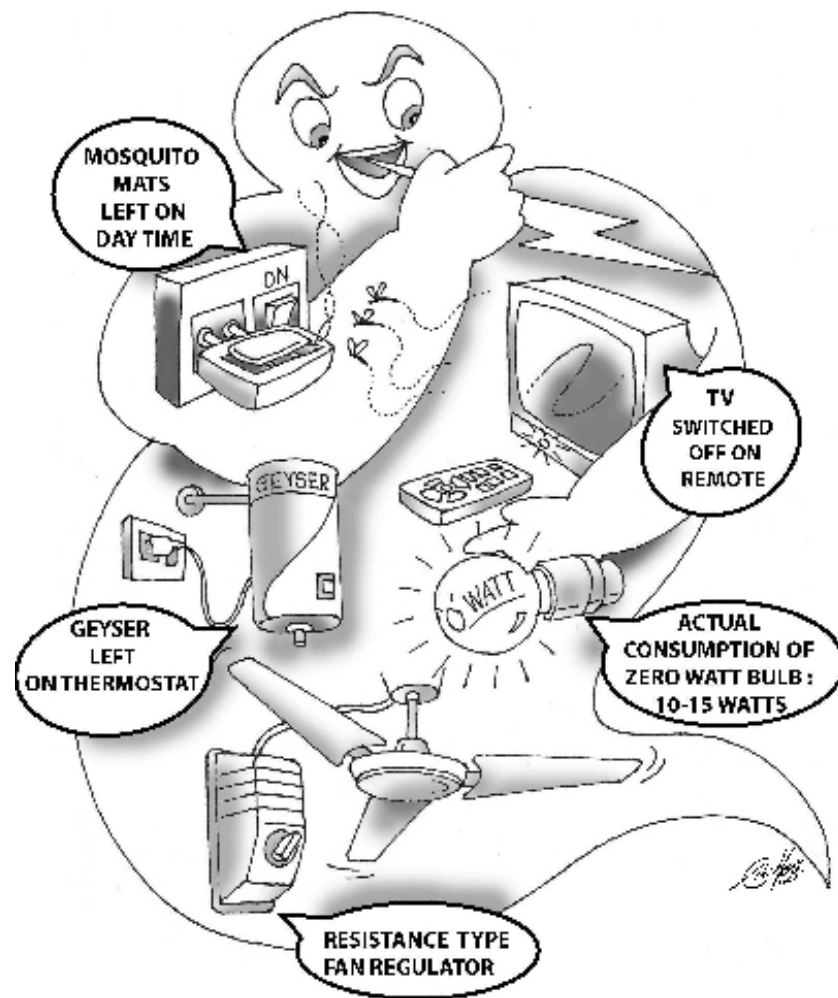
Entropy is associated with 'error', with 'disorder', with 'dissipation' and 'degradation'. Therefore, with a high entropy density in the 'World around' and also in the 'World within', man may eventually land into a whirl-pool of chaos and confusion and 'self-inflicted' and 'ego-inflated' strifes and strikes for so-called 'self-survival' on the edge of a precipice, poised precariously for a 'drama', which may be Nature's plan of paying man with his own coin, his own last act of plunging head-long into the 'mirage' of so-called self-survival and self-gratification, and to get in fact, quite something else which may be self-extinction and self-elimination.

The concept of driving the economy towards the concept of quantity, the concept of more magnitude, the concept of the much and the much more and

Because of higher speed of activity and aspiration towards more quantity of living rather than better quality of life, man gets trapped into higher entropy life and into the desire for more exuberance rather than more excellence.

BEWARE ! GHOST CONSUMERS

STEALING ELECTRICITY FROM YOUR HOME



towards the concept of lower cost of money or even the energy consumption in complete disregard of the 'energy-degradation' and what is worse still, of 'entropy-creation', is a dangerous economy. And so also is 'high entropy technology'. A technology based merely on the concept of the speed and production of so much of tangible goods with so much more of intangible entropy is equally a dangerous technology.

The danger lies not so much because of the rapid depletion of non-renewable resources of fossil fuel energy; but more so because of the complacency based on the concept that once the renewable resources like the solar energy or the nuclear such as fusion energy could be harnessed, man's energy problem would be solved once and for all.

But what good it would be, if with all the energy, man gets trapped in the entropy of his own making and, what, if such virtually non-exhaustive resources of energy at his command be fuelled to propel his exponentially increasing demand of energy consumption.

Energy degradation per capita, leading to a super-exponentially increasing rate of increase of entropy not only in the bio-sphere in world around man but also in the 'neuro-sphere' in the world within him.

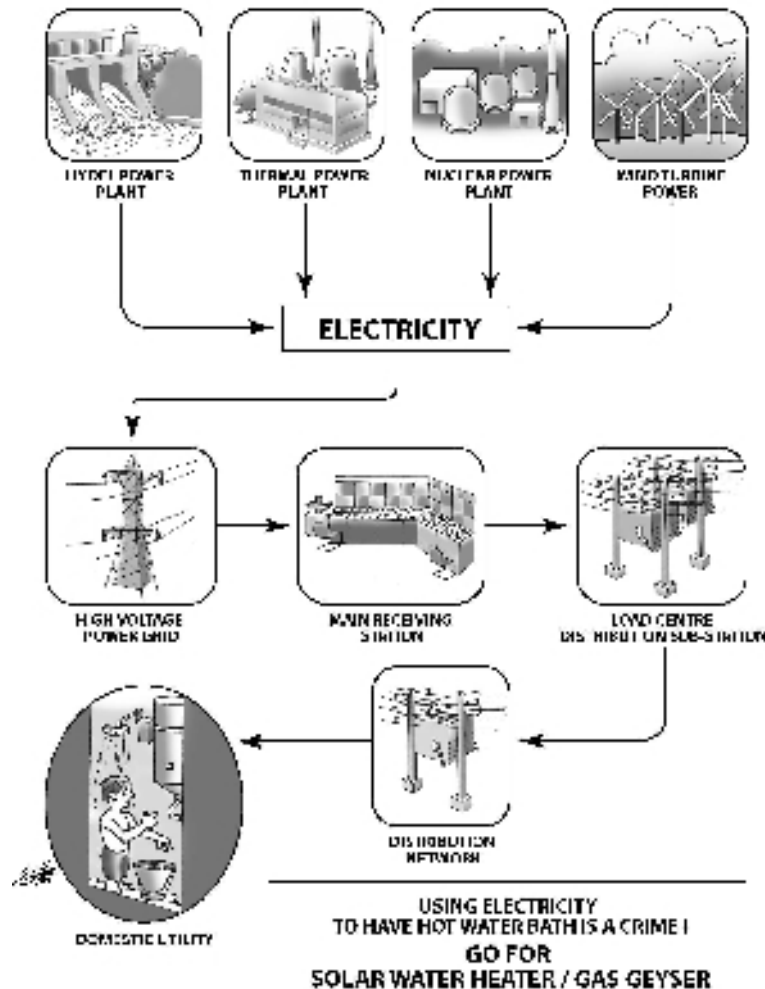
It is a fact of science that all systems, including the neuro-sphere can for good thermodynamic reasons, bear the load of only so much of entropy density and no further. Man may then face the risk of the worst of Eco-crisis viz. the crisis of a 'Critical Density of Entropy'

The danger then would be that the very process of initiating or accelerating scientific activities towards minimizing the entropy-density would merely accelerate further the rate of creation of entropy and thereby negate the very object of the process. Man may then get trapped in a very difficult and indeed a dangerously explosive situation much like the 'critical size' of an atom bomb.

What is necessary now is to have a hard, deep and a new look at energy and entropy and steer the society to a path of production based on a new technology and a new economy, based not only on the concept of 'total energetics' but also 'total entropics' not only on the concept of efficiency based on law of energy but more so the efficiency based on the law of entropy.

There is a need to get to the root of the troubles today-to the root of so much and so many crises viz., food-crisis, population-crisis, pollution-crisis, eco-crisis, cultural-crisis and certainly energy-crisis too.

HOW MUCH INVESTMENT THE GOVERNMENT HAS MADE SO THAT YOU CAN TAKE HOT WATER BATH



3.2 Measures for rational use of energy and demand management?

An extensive door to door campaign should be launched to educate the public on energy saving ideas. This shall be demonstrated in randomly selected residences/offices to provide more confidence level. Some of the ideas which can be explained practically are listed below:

3.2.1 Domestic Sector

- i. Do not use your T.V remote for switching off the T.V.- Switch-off from main.
- ii. Remote keeps consuming 6 watts of power even if TV is off. It holds good for UPS too which consumes 9 watts for home computers.
- iii. Switch off mosquito mats during daytime. Mosquito mats consume 5 watts
- iv. Install L.E.D lamps of 0.5 watts rating as night lamps, in stair case, outside area lighting, Puja Rooms, where low illumination level will suffice. Remember, so called Zero watts lamp consumes 12-15 watts for the same level of illumination, which can be, achieved with 0.5 watts L.E.D. Lamps.
- v. Use Compact Fluorescent Lamps (CFLs) for Bed Rooms, kitchen, Toilets, Bath Rooms, etc. CFL are better choice between 2 watts to 15 watts. Beyond that FTL with Electronic Ballast should be used.
- vi. Install 2 nos 20 watts Fluorescent Tube Lights (FTL) with electronic ballasts at 2 opposite walls of the room instead of a single 40 watts Tube light. This way you will have flexibility of switching off one of the .FTL.
- vii. Install 50 watts energy efficient fans with electronic step/ step less regulators/ instead of conventional 70- 80 watt fans with resistance type regulators.
- viii. Plan your work on computers so that you have to keep it ON for minimum hours. This will also be good for your health. Set your monitor to switch off automatically after 5 minutes and CPU after 1 Hr of continuous idle time.
- ix. Maintain a daily record of your Electricity meter reading. This will reveal you many things.
- x. Switch off Fridge in the winter / cold nights. Fridge consumes 1.2 to 4 units per day depending on size, model, make etc. Bigger fridge will consume more power. For smaller families 80 Litres fridge can be sufficient instead of 165 Litres fridge.

- xi. Introduce incentive scheme in your home/ office. Nominate Energy Manager at your home/school /office. Suggested methodology is given in 'Annexure-3'
- xii. Use solar water heater at home for heating water. Using High quality electricity for hot water generation is not morally correct. If use of solar water heater is not possible go for Gas Geysers. Where electric geyser is unavoidable Pl don't leave it on Thermostat. Electric geyser on thermostat causes standing losses of 1-1.5 units per day.

3.2.2 Transport Sector

- i) Promote organised pooling of personal vehicles. This will also provide employment and reduce pollution. The 'Exhibit-C' gives the details how it can be done
- ii) Promote shared Taxi/Auto services
- iii) Identify employees who can work from home at least on alternate days .IT companies, marketing sector and many other organizations should be easily able to do so.
- iv) Increase speed of clearance at road junctions. This can be done by synchronizing the signals and also by shifting the stop line 30-40 metres before the junction. The details of this idea are given in 'Exhibit-D'
- v) Promote use of two wheelers for single commuters. Giving some concessions on traffic rules for two wheeler users can do this. Like allowing 'U-turn' for two wheelers and permitting entry at some of the 'no-entry' roads
- vi) Encourage mutual transfer near place of residence.
- vii) Change Car allowance rules .Many people buy car just to claim the allowance. Instead the same money can be paid in some other form.
- viii) Promote distant education. Schools can be closed for different days and lectures may be given on TV/internet. Our the then President Dr Kalam has advocated that children may be involved in 'Energy Mapping' (Pl. refer Clause-6.2) .However, for this idea to succeed a policy decision has to be taken so that it is treated as substitute for Home work and suitable marks may be earmarked for such exercises.
- ix) Promote extensive use of internet/mobile for ticket bookings/order placement.
- x) Discourage unnecessary meetings/ conferences/ seminars in Hotels etc. Instead promote video conferencing. Even Interviews can be conducted through video- conferencing.
- xi) Spread information about alternate routes and put more road signs.

- xii) Promote agencies for door-deliveries of goods and services.
- xiii) Allow only even numbered vehicles in the congested/central areas on even hours, and odd numbered vehicles on odd hours. In many countries similar rules exist to de-congest central district areas.

3.2.3 Agriculture Sector

- i) Instead of providing Free power to the farmers which is often misused, Energy Efficient Pumping systems including pipes, foot valves, CFLs, LED lamps etc. should be provided at 50 % cost to all farmers.
- ii) Village level / Taluk level energy plans shall be implemented utilising the locally available energy sources.

3.2.4 Commercial Sector

- i) Ban use of excessive Lighting / Put upper limit of consumption.
- ii) Encourage Air- Cooling /Indirect evaporative cooling instead of Air-conditioning.
- iii) Encourage setting up of 'Reuse Shops' where sparingly used products can be exchanges or sold.
- iv) Identify shops/business establishments which can be closed down by offering some incentives to the owners.
- v) Extend scope of EC Act,2001 to all commercial & Business Establishment having Energy Bill, amounting to more than Rs 1Lakh per month.

3.2.5 Industrial Sector

- i) Ban use of electricity for heating / drying purposes
- ii) Identify units, which can be closed down by offering some incentives to the owners.
- iii) Make self declaration of energy consumption mandatory for all units.
- iv) Extend scope of EC Act,2001 to all industrial units having a connected load of 50 HP and above or oil equivalent

3.2.6 Municipal Corporations

It has been observed that there is a tendency amongst a section of the influential people including Corporators to pressurize the staff of the Municipal Corporations to fix HPSV Lamps in the residential localities including small lanes and streets. This is highly objectionable practice and needs to be curbed. There should be strict guidelines and instructions to provide HPSV lamps only on the main roads and junctions in residential localities and adherence to these guidelines must be ensured. The residential localities need to be provided with Tubelighs only.

The possibilities of energy savings in various functioning of municipal corporations are immense including water pumping, street lighting and solid waste handling. This is a subject in itself and most of the points are quite well known and need to be followed. Some new points are being given below for considerations.

- i) White painting of roads : It is a well known principle to save electricity by improving color and reflectivity of walls, ceilings, and floors so as to reduce lighting energy needs. Taking a clue from this principle , it is possible to reduce the no. of fittings either by painting the roads white or by providing cemented roads. This experiment may be tried on some circles. If it succeeds, then this will not only save electricity but will also improve the aesthetics.
- ii) Utilizing Moonlight : We get around 30 days of good moonlight in the whole year which can be utilized to partly reduce the lighting need .Some experiments need to be carried out to get the maximum benefits from the moonlight.
- iii) Involving security agencies to monitor street lighting : If the bifurcation of the street lighting is carried out then it will be possible to switch off lights on one side of the road after midnight .For this purpose security agencies may be involved who will not only work as security agency but will also do the work of monitoring the street lighting.
- iv) Experimenting with Light Distribution : The different parameters such as pole height, angle and distances between poles need to be studied so that the best possible parameters could be fixed to get maximum distribution of light.

3.2.7 Government Buildings/Offices

It is well known that Govt. Buildings/offices are one of the biggest wasters of energy. However, some of the state governments have started taking the prevailing wasteful practices seriously. The order of AP Govt. (Pl. refer Annexure-3) is a good example for other states to follow. There is need for all government departments/PSUs to issue similar orders and appoint Energy Observers.

CHAPTER-4

Recommendations for R & D areas for Energy Efficient Appliance/Equipment/Processes

Considering the present shortcomings it is suggested that all the R & D programmes should be reviewed for their effectiveness & proper methodology evolved for taking up energy efficiency & renewable energy based projects. These projects can be divided into 3 categories

Category -I : Research based projects for identifying technology / processes / Equipment Methods/ procedures/ controls etc., which need research Inputs.

Category – II : Development Projects involving application of basic research projects

Category - III : Demonstration projects which have been proved viable in the Development stage.

Category - IV : Popularisation projects for multiplier effects of the Demonstration projects.

For popularization of these projects, certified energy auditors and energy managers, NGOs working in this field, industries associations & other representative professional bodies should be involved actively & publicity in all the technical journals should be given in addition to print and electronic media.

4.1 Areas of product development in Domestic Sector

A few product ideas that need R & D inputs are described here

4.1.1 Refrigerator cum Hot Chamber

With changing social norms and ways of living there is a great scope for a product which can keep food cool or hot as per requirement. If we could develop a refrigerator that can store condenser heat in lower part of the refrigerator then it will not only be very convenient for small families but will also save time and energy in reheating the products.

IS IT POSSIBLE TO HARNESS COSMIC ENERGY?

Global Energy Independence Day is held each year on July 10,
the birth date of Nikola Tesla.

Purpose :

To promote emerging energy technologies that move us away from oil dependence.

JULY 10, 2006 MARKS THE 150TH ANNIVERSARY OF TESLA'S BIRTH

"I have harnessed the cosmic rays and caused them to operate a motive device." Nikola Tesla; Brooklyn Eagle, July 10th, 1931.



Dr. Nikola Tesla : The man who invented the twentieth century is now shaping the twenty-first century as the "Father of Free Energy".

Dr. Nikola Tesla not only wanted to give the world free energy, Tesla developed components of technology whereby it could be accomplished. Tesla was a physicist, inventor, and electrical engineer of unusual intellectual brilliance and practical achievement. He was of Serb descent and most of his work was conducted in the United States. Tesla's investors dropped the project when they realized there was no way to meter the power to make money on the end user. We've been trying to catch up for 100 years and are still far behind where he was with his understanding of radiant energy. With reportedly over 700 patents awarded him worldwide, no wonder it has taken us so long to catch up. The man who shaped the twentieth century, with his invention of the radio, radar, x-ray, AC power, and the induction motor, is now shaping the twenty-first century as we finally begin implementing his methods of tapping and distributing free energy.

4.1.2 Pump less Desert water cooler

The traditional Desert coolers available in the market are having a water pump installed for circulating the water. The pump consumes around 20 % of the total electricity consumed by the cooler. Additionally, the pumps are of inferior quality, rarely maintained and do not last for more than few years causing discomfort in the peak season.

There is need for a pump less desert cooler which completely eliminates the necessity for circulating water pump and thus not only reduces the Electricity cost but also improves the reliability of the system with reduced noise.

4.1.3 Vapour Absorption based Domestic Air-conditioners

This idea will help increase the utility of Solar water Heaters. During summer or good sunny days the extra hot water can be utilized to produce refrigeration through vapour absorption route. Already Air-conditioners of about 10 TR are available working on hot water vapour absorption route.

4.1.4 Water Pump cum exerciser

Most of us indulge in one or other forms of exercise. This idea is to utilize the energy spent in doing the exercise for useful purposes. An exercising machine should be developed based on scientific principles so that while our body gets the exercise it needs, the energy spent is utilized to do some useful work like pumping of water or charging batteries. This will not only save electricity in pumping water to overhead tank or charging batteries of inverter/UPS ,but will also increase public interest in daily exercise and improve health.

4.1.5 Timer controlled switches

One of the primary reasons for wastage of electricity in domestic sector is our tendency to forget to switch-off lights/fans. Development of 'Timer controlled Switches' for domestic sector is the need of the hour.

4.1.6 Special products for Rural Homes

- i) Designing variety of solar cooking systems with better efficiencies, better cooking capabilities, cheaper cost, ease of manufacturing, DIY (Do It Yourself) designs etc.

- ii) Developing applications like producing distilled water, candle making etc. by utilizing idle time of solar cookers in the afternoon hours.
- iii) Design of solar cookers for livelihood generation at rural level.
- iv) Design of accessories like cooking pots, tracking mechanisms etc. for improving efficiency of RE cooking systems.
- v) Generating bio-diesel at household level from non-edible oil seeds.
- vi) Developing innovative fuels for biogas generation.
- vii) Developing technologies for utilization of biogas for automobiles at domestic level.
- viii) Use of biogas for small-scale power generation.
- ix) Designing lighting systems for remote isolated houses and villages.
- x) Designing innovative applications of biomass gasifiers.

4.1.7 Renewable Energy Products for Industrial Applications

- i) Solar concentrators for industrial applications like ovens, thermic fluid heaters, small-scale steam generators etc.
- ii) Developing renewable energy systems for food processing industries.

CHAPTER-5

Recommendations on Policy Matters

5.1 Introduction of Integrated Financing of EERE products with housing finance schemes.

At present, there are several banks and financial institutions offering housing finance. On the other hand, MNRE is offering subsidies and soft loans for purchase of renewable energy devices like solar water heaters, home lighting etc. It is a well-known fact that these subsidies and soft loans mechanism due to administrative formalities is not very effective to promote these devices. In fact, it may be detrimental to their growth and may do more harm than good.

In order to reduce administrative hurdles, it will be better if the subsidies are integrated into housing finance. For example, a reduction in interest amount equivalent to the subsidy may be offered to those who are interested in installing solar water heaters, solar lighting systems and energy efficient lighting systems like CFLs. Alternately, instead of giving subsidy, the government may think of giving tax rebates to those who install EERE devices in their homes. In order to claim tax rebates, the self declaration should be taken as sufficient to minimize the formalities. This way, administrative hurdles will be minimized and EERE devices will get real boost for new housing and other projects. This will lead to increased production of EERE products and an automatic increase in employment opportunities in this sector.

The integration of financial benefits with the long term housing finance will make EERE products very viable because the monthly installment will work out less than the cost of energy savings. This is very true in the case of solar water heaters and CFLs. Thus, a person who avails such a loan will not feel any burden because the repayment will be taken care of by reduction in electricity bills.

At present IREDA has a primary finance to banks, which in turn extends it to the end users. It will be a good idea that IREDA extends the finance to the housing finance companies and banks to club the finance on these renewable energy gadgets with the housing finance loans and allow repayment as per the housing norms. The tax rebates or depreciation benefits are not applicable for the household use and need not create any complications. Capital subsidies if applicable should be reduced from the housing loan amount.

The technologies those should qualify for such benefits shall include Solar water heaters, solar cookers, solar dryers (drying clothes, food grains etc). solar chimney ventilators, turbo- ventilators, kitchen waste based biogas plant (ARTI



concept), CFLs, FTLs with electronic chokes and tri-phosphor lamps, LEDs, Rain Water Harvesting etc.

Ministry of New & Renewable Energy (MNRE) has a scheme of giving 10% subsidy to green building projects (for govt. buildings only). Some sort of incentives can be incorporated with housing finance companies and banks for the clients going for energy efficient buildings or solar passive architecture etc.

5.2 Introduction of Long Terms Financing Schemes for purchase of EERE products

The first step suggested above will help the persons who are planning for new construction but will not help the existing installations. Hence, similar scheme may be introduced for long term financing of the EERE products for such potential users integrating all the benefits offered by MNES. It is not out of place to mention here again that once the public understands the benefit of long-term finance of EERE devices i.e. savings more than the monthly installment, and that the product itself is paying back the cost without creating any financial burden then there will be huge demand for EERE products.

One such effort has been made in Nasik district by few enthusiastic employees of the electricity board. The person who proposed the scheme is Mr. Hira Jadhav. They introduced a scheme and sold more than 10 lakh CFLs on long term financing. Cost of CFL was fixed as Rs. 100/-, contracts were made with few reputed suppliers and the CFLs were sold to the end users through demonstration programmes in different villages. (They used to demonstrate the light intensity by lux meters and power consumption with reference to incandescent lamps). The cost of Rs. 100/- was recovered by the electricity board in 10 installment of Rs. 10 each along with their electricity bills. This innovative scheme worked well because the end users were paying small installments of Rs. 10/- per month for one CFL (If a person purchases 5 CFLs, he needed to shell out almost Rs. 600/- as the retail rate was around Rs. 120/-), now he gets it at Rs. 50/- per month for 10 months. The suppliers gave competitive prices looking at the volumes. They were also assured of the payment as the recovery was to be done by the electricity board. We can propose similar mechanism to be implemented through electricity boards. This can work well for CFLs, LED lamps, electronic chokes etc.

5.3 Introduction of “Small Energy Saving Scheme”

We have schemes to encourage small savings by which we are able to collect huge amount of money at low interest rates. These schemes help encourage saving habits as well as provide employment opportunities. There is a Directorate of Small Savings in each state which co-ordinates implementation of such schemes and gives cash prizes to those who deposit their savings in these schemes.

In line with cash saving schemes, we should have a scheme to encourage energy savings. These schemes may be called “Small Energy Saving Schemes”(SES Scheme). To begin with these schemes may be introduced in all the government offices, public sector units , municipal corporations, semi-government institutions etc. These schemes may be operated as follows :

1. Last 2 years average consumption in terms of kWh or Kilo Litres of Oil may be calculated and agreed upon between the management and the employees union.
2. It is further agreed that all the employees will jointly monitor the energy consumption and implement means to gradually reduce the energy consumption in their offices/establishments.
3. In the first year the target is set to bring down the energy consumption by 10 % of the average value in the base year.
4. The savings achieved in terms of Kwh/Kilo Litres is converted into Rupees considering old and new rates.
5. 50 % of the savings achieved is distributed amongst the employees and the balance 50% is reinvested in improving energy efficiency.
6. Next year the target is set for 15 % of the average value of the base year. Gradually, in the next 3-4 years the energy consumption is brought down by 30 % in comparison to the base year consumption.

In line with cash saving schemes, we should have a scheme to encourage energy savings. These schemes may be called Small Energy Saving Schemes.

The SES Scheme will not only help in bringing down the energy consumption in the work place of the employees but will slowly and surely spread into the homes of the employees. This saving habit will transform the entire country into an energy efficient nation. It is need less to discuss how such a scenario will help the employment generation and associated benefits to the country's economy.

The above steps will not require any additional flow of funds from the Government. Only some minor policy decisions will have to taken and the right atmosphere will have to be created. The government has to act just as a facilitator. The critics may say that this will require huge efforts on the part of the government but this is nothing in comparison to the kind of efforts being made

on setting up new power plants and finding new oil wells.

5.4 Introduction of Mandatory Technical Audit :

In the 11th Five Year Plan , projects costing lakhs of Crores of Rupees will be implemented in the public sector. The planning of these projects will have to undergo detailed project reports , preparation of drawings and detailed specifications of various items and equipments. Though these functions would be carried out by the panel of persons specialised in their respective fields or by respective consultants, none of these activities will be scrutinised by a competent third party specialised in project consultancy.

Due to lack of proper technical expertise, utility equipments like air conditioning and process cooling systems, air compressors, boilers and steam pipings, DG sets etc. are often selected keeping very high safety margins of over 100 – 200 % in both capacities and quantities.

This results in un-necessary expenditures on the oversized and extra items, as huge sums of money are blocked in procuring the same while more important items have been left out. The main cause of these problems are:

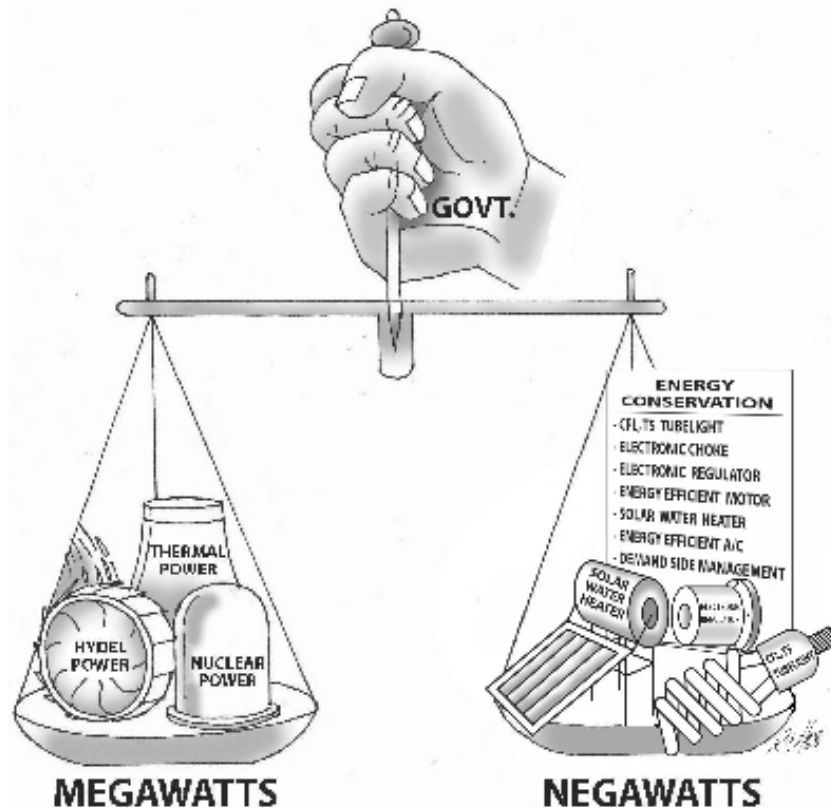
- Inadequacy of available data.
- Unawareness about the requirements of the end user.
- Inexperience of the persons allotted for the selection work.
- Unnecessary weightage given to future expansion, which has very less chances of materialization.
- Quantities and capacities of equipments are sometimes increased on purpose, for obvious reasons.

5.4.1 Concept Of Technical Audit

A prudent way to overcome such a situation is to introduce Technical Audit. This concept of technical audit of new projects has been made compulsory in many European countries and has helped them immensely in cutting down capital investment to a great extent, thus helping their economy with reduced cost of production.

Technical audit is basically an intense scrutiny of an engineering item planned as a pre- requisite of a project to be set up , in respect of its capacity , quantity , and other specifications. This is carried out with a view to ensure its best performance, utility and adequacy. It involves value analysis in which the specification of the equipments are checked whether they suite the infra structure requirements.. Hence, in this process the over sizing or even undersizing of the equipments is avoided. All in all , in the selection of appropriate technological and utility equipments as far as their specification and

**THERE IS A NEED TO TREAT
MEGAWATTS AND NEGAWATTS AT PAR
AND ALLOCATED EQUAL FUNDS**



quantities are concerned.

In other words Technical audit helps the project implementation authorities to decide about the adequacy of and necessity of an engineering item or equipment before they are ordered.

5.4.2 Expected Benefits with Compulsory Technical Audit

i. Saving in Capital Investment

As per the experience gained during execution of earlier projects, 10-20% of the investment can be avoided with proper Technical audit. Even by taking a conservative figure of 10%, an estimated amount of over Rs 70,000 crores can be saved in the Eighth Plan. Considering other benefits mentioned below the savings work out to be more than Rs 20,000 crores per year.

ii. Employment Generation

It is estimated that around one lakh engineers and other supporting staff can be gainfully employed with very little investment. The Certified Energy Auditors can also be utilised for this purpose.

iii. Will Make Engineers More Accountable

Compulsory technical Audit will help in fixing proper accountability in Government and public sector under taking as well as large private sector organizations. However, to achieve this objective, Technical Auditors will have to be first made accountable and they should guarantee that the final selection of equipments is within +10% to +15% of the requirement.

iv. Saving of Operational & Maintenance Costs

There will be a better utilization of equipment with more appropriate value based selection which will result in saving on recurring based on maintenance & operation of plants.

v. Timely Completion of Projects

With proper accountability of the technical auditors, and more appropriate selection of equipment, projects will be completed faster thus avoiding cost over run & production losses.

5.4.3 Suggested Methodology

It is suggested that a study may be undertaken of the selected existing industries all over India so that the experience gained in the execution of these projects can be analysed to find out the areas of maximum potential for reduction in capital investment and future operational costs.

The main objective of the study shall be:

a. To estimate the saving achievable with introduction of the Compulsory

Technical Audit.

- b. To highlight the areas of maximum potential and easily achievable savings.
- c. To suggest the steps required to be taken by the government prior to the introduction of Compulsory technical Audit.
- d. To involve methodology for its implementation and regular monitoring.
- e. To involve methodology for appraisal of technical Auditors.

Considering the vast potential offered by the concept of technical audit it is imperative for the Government to start an immediate action plan for effective utilization of this concept in the planning of the new projects.

5.5 Ban use of electricity for low grade heating and drying.

Electricity is a high quality energy. Using electricity for low grade heating purposes like generation of hot water/ air drying, requiring temperatures below 85°C must be immediately banned. It is estimated that about 5-6 % of electricity is being used for these purposes.

5.6 Ban manufacture of energy inefficient items.

The time has come to ban the manufacture of all energy inefficient items like incandescent bulbs, resistance type fan regulators, and wire wound chokes. There is a provision in the Energy Conservation Act 2001, under which this action can be taken by the Govt.

5.7 Introduction of mandatory provisions for 'Embodied Emission ratings'

In view of the imminent dangers due to Global Warming and the awareness created on the effects of Climate Change, plus to fight the evils of increasing consumerism, it will be prudent if suitable mandatory provisions are introduced to categorise end products with their embodied CO₂ emission. Such a mandatory provision will promote eco-friendly products. The ratings could be on a scale of 1-10 with a product having least embodied CO₂ emission rated as 1 in comparison to similar other products, while the product having maximum embodied emission rated as 10.

CHAPTER-6

Important Points from Dr. Kalam's speeches

6.1 Speech on the occasion of 59th Independence day- Call for "Energy Independence by 2030"

Today on this 59th Independence Day, I would like to discuss with all of you another important area that is "Energy Security" as a transition to total "Energy Independence". Energy is the lifeline of modern societies. But today, India has 17% of the world's population, and just 0.8% of the world's known oil and natural gas resources. We might expand the use of our coal reserves for some time and that too at a cost and with environmental challenges. The climate of the globe as a whole is changing. Our water resources are also diminishing at a faster rate. As it is said, energy and water demand will soon surely be a defining characteristic of our people's life in the 21st Century.



Energy Security rests on two principles. The first, to use the least amount of energy to provide services and cut down energy losses. The second, to secure access to all sources of energy including coal, oil and gas supplies worldwide, till the end of the fossil fuel era which is fast approaching. Simultaneously we should access technologies to provide a diverse supply of reliable, affordable and environmentally sustainable energy.

Energy Security, which means ensuring that our country can supply lifeline

energy to all its citizens, at affordable costs at all times, is thus a very important and significant need and is an essential step forward. But it must be considered as a transition strategy, to enable us to achieve our real goal that is - Energy Independence or an economy which will function well with total freedom from oil, gas or coal imports. Is it possible?

Hence, Energy Independence has to be our nation's first and highest priority. We must be determined to achieve this within the next 25 years i.e by the year 2030. This one major, 25-year national mission must be formulated, funds guaranteed, and the leadership entrusted without delay as public-private partnerships to our younger generation, now in their 30's, as their lifetime mission in a renewed drive for nation-building.

Goals and Policies

Now friends, I would now like to discuss with you some goals, strategies and policies for a major national mission to attain Energy Independence.

Energy Consumption Pattern in India in 2005: We have to critically look at the need for Energy Independence in different ways in its two major sectors: Electric power generation and Transportation. At present, we have an installed capacity of about 121,000 MW of electricity, which is 3% of world capacity. We also depend on oil to the extent of 114 million tonnes every year, 75% of which is imported, and used almost entirely in the Transportation Sector. Forecasts of our Energy requirements by 2030, when our population may touch 1.4 billion people, indicate that demand from power sector will increase from the existing 120,000 MW to about 400,000 MW. This assumes an energy growth rate of 5% per annum.

Electric Power Generation Sector: Electric power generation in India now accesses four basic energy sources: Fossil fuels such as oil, natural gas and coal; Hydroelectricity; Nuclear power; and Renewable energy sources such as bio-fuels, solar, biomass, wind and ocean. Fortunately for us, 89% of energy used for power generation today is indigenous, from coal (56%), hydroelectricity (25%), nuclear power (3%) and Renewable (5%). Solar energy segment contributes just 0.2% of our energy production.

Energy Independence in Electric Power Generation

Thus it would be seen that only 11% of electric power generation is dependent on oil and natural gas which is mostly imported at enormous cost. Only 1% of oil is (about 2-3 million tonnes of oil) being used every year for producing electricity. However, power generation to the extent of 10% is dependent on high cost gas supplies. We are making efforts to access natural gas from other countries. Now I shall discuss another fossil fuel, coal. Even though India has abundant quantities of coal, it is constrained to regional locations, high ash content, affecting the thermal efficiency of our power plants, and also there are

environmental concerns. Thus, a movement towards Energy Independence would demand accelerated work in operationalizing the production of energy from the coal sector through integrated gasification and combined cycle route. In 2030, the total energy requirement would be 400,000 MW. At that time, the power generated from coal-based power plants would increase from the existing 67,000 MW to 200,000 MW. This would demand significant build-up of thermal power stations and large scale expansion of coal fields.

Changing Structure of Energy Sources:

The strategic goals for Energy Independence by 2030 would thus call for a shift in the structure of energy sources. Firstly, fossil fuel imports need to be minimized and secure access to be ensured. Maximum hydro and nuclear power potential should be tapped. The most significant aspect, however would be that the power generated through renewable energy technologies may target 20 to 25% against the present 5%. It would be evident that for true Energy Independence, a major shift in the structure of energy sources from fossil to renewable energy sources is mandated.

Solar farms

Solar energy in particular requires unique, massive applications in the agricultural sector, where farmers need electricity exclusively in the daytime. This could be the primary demand driver for solar energy. Our farmers demand for electric power today is significantly high to make solar energy economical in large scale.

Shortages of water, both for drinking and farming operations, can be met by large scale seawater desalination and pumping inland using solar energy, supplemented by bio-fuels wherever necessary. The current high capital costs of solar power stations can be reduced by grid-locked 100 MW sized Very Large Scale Solar Photovoltaic (VLSPV) or Solar Thermal Power Stations. In the very near future, breakthroughs in nano technologies promise significant increase in solar cell efficiencies from current 15% values to over 50% levels. These would in turn reduce the cost of solar energy production. Our science laboratories should mount a R&D Programme for developing high efficiency CNT based Photo Voltaic Cells.

We thus need to embark on a major national programme in solar energy systems and technologies, for both large, centralized applications as well as small, decentralized requirements concurrently, for applications in both rural and urban areas.

Nuclear Energy

Nuclear power generation has been given a thrust by the use of uranium based fuel. However there would be a requirement for a ten fold increase in nuclear

power generation even to attain a reasonable degree of energy self sufficiency for our country. Therefore it is essential to pursue the development of nuclear power using Thorium, reserves of which are higher in the country. Technology development has to be accelerated for Thorium based reactors since the raw material for Thorium is abundantly available in our country. Also, Nuclear Fusion research needs to be progressed with international cooperation to keep that option for meeting the large power requirement, at a time when fossil fuels get depleted.

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Power System Loss Reduction:

Apart from generating power and running power stations efficiently without interruption, it is equally essential to transmit and distribute the power with minimum loss. The loss of power in transmission and distribution in our country is currently in the region of 30-40% for a variety of reasons. Of about one thousand billion units of electrical energy produced annually, only 600 billion units reach the consumer. This is the result of transmission loss and unaccounted loss. We need to take urgent action to bring down this loss to 15% from 30-40% by close monitoring of the losses, improving efficiency, and increasing the power factor through modern technology. By this one action alone we will be able to avoid the need for additional investment of around Rs. 70,000 crores for establishing additional generating capacity.

Transportation Sector

The Transportation Sector is the fastest growing energy consumer. It now consumes nearly 112 million tonnes of oil annually, and is critically important our nation's economy and security. The complete substitution of oil imports for the Transportation Sectors is the biggest and toughest challenge for India.

Use of bio-fuels:

We have nearly 60 million hectares of wasteland, of which 30 million hectares are available for energy plantations like "Jatropha". Once grown, the crop has a life of 50 years. Each acre will produce about 2 tonnes of bio-diesel at about Rs. 20 per litre. Biodiesel is carbon neutral and many valuable by-products flow from this agro-industry. Intensive research is needed to burn bio-fuel in internal combustion engines with high efficiency, and this needs to be a urgent R&D programme. India has a potential to produce nearly 60 million tones of bio-fuel

annually, thus making a significant and important contribution to the goal of Energy Independence. Indian Railways has already taken a significant step of running two passenger locomotives (Thanjavur to Nagore section) and six trains of diesel multiple units (Tiruchirapalli to Lalgudi, Dindigul and Karur sections) with a 5% blend of bio-fuel sourced from its in-house esterification plants. In addition, they have planted 75 lakh Jatropha saplings in Railway land which is expected to give

yields from the current year onwards. This is a pioneering example for many other organisations to follow. Similarly many States in our country have energy plantations. What is needed is a full economic chain from farming, harvesting, extraction to esterification, blending and marketing. Apart from employment generation, bio-fuel has a significant potential to lead our country towards energy independence. The other critical options are development of electric vehicles; hydrogen based vehicles, electrification of Railways and urban mass transportation.

Conclusion

By 2020 the nation should achieve comprehensive energy security through enhancement of our oil and gas exploration and production worldwide. By the year 2030, India should achieve energy independence through solar power and other forms of renewable energy; maximize the utilization of hydro and nuclear power and enhance the bio-fuel production through large scale energy plantations like Jatropha.

We need to evolve a comprehensive renewable energy policy for energy independence within a year. This should address all issues relating to generation of energy through wind, solar, geothermal, bio-mass and ocean. The nation should also work towards establishment of thorium based reactors. Research and technology development of Thorium based reactors is one of the immediate requirements for realizing self-reliance in nuclear power generation and long term energy security for the nation.

We should operationalize a 500 MW capacity power plant using integrated gasification and combined cycle route within the next three years from the existing pilot plant stage.

Bio-fuel research should be extended in collaboration with R&D Laboratories, academic institutions and automobile industry to make it a "full fledged fuel" for the fleet running in the country in a time bound manner. This should lead to a

mission mode integrated programme encompassing various ministries and industries. Also there is a need to formulate a comprehensive Bio-Fuel policy from research, development, production to marketing.

Energy security leading to Energy independence is certainly possible and is within the capability of the nation. India has knowledge, natural resources; what we need is planned integrated missions to achieve the target in a time bound manner. Let us all work for self-sufficient environment friendly energy independence for the nation.

6.2 Speech on 14th Dec'05 on the occasion of National Energy Conservation Day

Peak Load Management

I would suggest implementation of staggered working hours for the whole country based on the determination of the existing peak demand period in various parts of the country. This will definitely be possible in a large country like ours. For example Sun rises at Agartala one hour before the Sun rises in Mumbai. If we follow such a staggered system of working hours in different parts of the country, it will definitely be possible to remove the peak hour shortage of 10 to 12%. In addition, we can also think of staggered working hours and working days in various industries within a metropolitan city for enabling reduced congestion on the roads leading to smooth flow of traffic on all the days. Ministry of Power may like to analyze the problem and suggest a staggered working hour model for the whole country for ensuring full availability of peak load demand of all industries.

Mapping the Neighborhood by the children

In my many interactions with school children, parents, teachers and educationist, I have been told that our existing educational process tends to emphasize learning by memory rather than strengthening creativity. The essence of Science & Technology on the other hand is embedded in two of the most fundamental impulses – the desire to discover and the desire to invent. It is vital that our education process nurtures and nourishes these two impulses.

An attempt in this direction has been made in a pilot programme called "Mapping the Neighborhood" initiated by the Department of Science and Technology. In Almora district in Uttaranchal children from 20 schools have been motivated to use mapping techniques to investigate and map basic socio-economic, environmental and ecological issues being faced by the neighborhood community. Armed with the scientific and technological tools such as Global Positioning System (GPS), Geographic Information System (GIS), Space Imagery incorporated in the hand held computers; the children are creating maps with the neighborhood details to improve their understanding of the immediate environment. These maps will enable further the technological

community to find solutions for the regeneration of fast disappearing natural sources of water, improving road connectivity, finding better locations for electricity and water distribution points, reducing traffic congestion and improved systems of garbage collection.

Another children programme can be launched through a creative task. The children can be asked to map the energy consumption of each of the household, industry, hospital and the hotels in a particular area. They can also request their own parents and the other members in the locality to save electricity in their buildings to the extent possible by switching off the lights, fans, air-conditioners, and other electronic gadgets when they are not needed continuously. This measure will not only save electricity but also prevent accident occurring due to electrical short circuits.

If this awareness for saving electricity comes to our youth, I am sure we will easily be able to save more than 10% of the energy consumption. This will also give our youth an opportunity for participating in our national development mission which they have been constantly asking during my various interactions.

Energy consumption: Targets

One of our experts says that "For a normally constructed building, the present energy consumption in India is 300 kWh per m sq annually which can be brought down to 140 kWh per m sq annually by proper designs/details/philosophy, whereas in Germany with its strict energy codes it is reported that the consumption is only 50 kWh per m sq annually. It is all the more important for India to achieve at least a target of 100 kWh per m sq annually with in the next 5 years. This will need coordinated effort between architects, builders and the energy engineers, a newly developed expertise.

The architects and building planners have to play a very important role in the design of the building with these features. The seeds of this perspective have to be sown in the schools of architecture and town planning. Energy conservation should start right from the location of the site, the direction of buildings, windows, doors, glare etc., the aim should be to use maximum advantage of the sun and wind, while minimizing the wasteful heat load from sun into the buildings and roofs.

Embodied Energy

The construction sector plays a significant role in economic development of the country. Activities in the construction sector are complex, highly dispersed and

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resource demanding. The activities of the sector result in the loss of important natural assets and impose severe stress on the environment. Agricultural land is often lost through urbanization and extraction of raw materials. The consumption of fossil fuels contributes to increased air pollution and emissions of greenhouse gases. Energy is required for manufacturing materials, for transport and for construction of buildings. Apart from this initial energy use, there is also need for energy for functioning of buildings. In the developed countries there is a growing demand for an environmental impact assessment of all building projects, which includes considerations of embodied energy i.e. the energy that is consumed in extraction of raw materials and production of finished building materials.

However construction is crucial to the prosperity and civilization of human beings. People require habitats, schools, work places, markets, places for sports and cultural activities. Our task therefore is to have more and better construction for our billion people, but minimize per capita energy consumption in the whole chain by value addition in construction and maintenance. There is a need to reduce the embodied energy especially in respect of office buildings, hospitals and hotels by at least 10% of the present embodied energy consumed which is in the region of five thousand kilo watt hour per square meter.

- (a) Creating an enterprise wise review mechanism to reveal the variance from planned utilization to the actual. As far as possible try to allocate the responsibility for this variance and take immediate corrective action.
- (b) Creating an idea bank in which employees can provide innovative solutions for energy efficient operations. There must be a system of analysis of ideas for implementing practical ideas on the shop floor and suitable reward.
- (c) It is essential to install progressively, the energy efficient nano lamps, energy efficient heating and AC system in the enterprise. For example, nearly seventy five million households in the rural sector today do not have electrical connection. It would be a great saver of electricity if we can install nano crystal based LED lamps in all these rural houses.
- (d) A mission mode programme can be created for energy conservation. We have to set yearly target of saving twenty five billion units per year from the present 3.2 billion units, so that we can wipe out the existing shortage within the next four years.
- (e) Preparation and circulation of a small booklet enumerating the simple to follow good practices for energy conservation by offices, residential complexes, industries and agricultural farmers.
- (f) In house R&D establishment should constantly work towards energy efficient processes for adoption in both residential and commercial buildings.

CHAPTER-7

Recommendations of Integrated Energy Policy-2006

India faces formidable challenges in meeting its energy needs and providing adequate energy of desired quality in various forms to users in a sustainable manner and at reasonable costs. India needs to sustain a 8% to 10% economic growth to eradicate poverty and meet its economic & human development goals. Such economic growth would call for increased demand for energy and ensuring access to clean, convenient and reliable energy for all to address human development. To deliver a sustained growth of 8% through 2031, India would, in the very least, need to grow its primary energy supply by 3 to 4 times and electricity supply by 5 to 7 times of today's consumption. By 2031-32 power generation capacity would have to increase to 778095 MW and annual coal requirement would be 2040 mt, if we don't take any measures to reduce requirement. Along with quantity the quality of energy supply has to also improve. The energy challenge is of fundamental importance to India's economic growth imperatives.

The broad vision behind the energy policy is to reliably meet the demand for energy services of all sectors including the lifeline energy needs of vulnerable households, in all parts of the country, with safe and convenient energy at the least cost in a technically efficient, economically viable and environmentally sustainable manner. Assured supply of such energy and technologies at all times considering the shocks and disruption that can be reasonably expected is essential to providing energy security to all. Meeting this vision would require that India pursues all available fuel options and forms of energy, both conventional and non-conventional, as well as new and emerging technologies and energy sources. Coal shall remain India's most important energy source till 2031-32 and possibly beyond. India will need to take a lead in seeking clean coal technologies and, given its growing demand, new coal extraction technologies such as in-situ gasification to tap its vast coal reserves that are difficult to extract economically using conventional technologies.

The approach of the Committee is directed to realise cost-effective energy system. For this the following are needed:

- (i) Markets that promote competition.

The broad vision behind the energy policy is to reliably meet the demand for energy services of all sectors including the lifeline energy needs of vulnerable households.

- (ii) Pricing and resource allocation to take place under market forces under an effective and credible regulatory oversight, as far as possible.
- (iii) Subsidies to be transparent and targeted.
- (iv) Improved efficiencies across the energy chain.
- (v) Policies that reflect externalities of energy consumption.
- (vi) Policies that rely on incentives and which are implementable.

A competitive market without any entry barriers is theoretically the most efficient way to realise optimal fuel and technology choices for extraction, conversion, transportation, distribution and end use of energy. The tax structure and regulation across energy sub-sectors should be consistent and institutional arrangements should provide a level playing field to all players.

An integrated energy policy is needed to ensure that energy availability does not become a constraint on India's economic growth and competitiveness.

Social objectives should be ideally met through direct transfers. Environmental externalities should be treated uniformly and internalised, as far as possible, under the polluter pays principle. An energy market with the foregoing features would minimise market distortions and maximise efficiency gains. An integrated energy policy is needed to ensure that energy availability does not become a constraint on India's economic growth and competitiveness. While the medium to long-term challenges of ensuring competitive energy supplies are formidable, the immediate problem of power and coal shortages also require policy actions. The policy recommendations have addressed the immediate as well as the medium to long-term issues.

Some key recommendations are summarised below:

- (i) Coal Shall Remain India's Primary Energy Source till 2031-32, Current shortages are a concern:
 - (a) Coal accounts for over 50% of India's commercial energy

consumption and some 78% of domestic coal production is dedicated to power generation. Since prices were de-controlled, the sector has become profitable primarily as a result of price increases and the rising share of open cast production. The present shortage can be addressed by encouraging imports which are also needed from a longer-term perspective. Thus we need to facilitate coal imports and create the needed infrastructure. Imports also put a competitive pressure on domestic coal industry to be efficient.

- (b) The Committee has concluded that imported coal is far more cost competitive to imported gas for power generation especially along the western & southern coasts of India. Such a cost advantage is likely to continue.
 - (c) At the same time domestic coal production should be stepped up by allotting coal blocks to central and state public sector units and for captive mines to notified end users. Coal blocks held by Coal India Limited (CIL) which CIL cannot bring into production by 2016-17, either directly or through joint ventures, should be made available to other eligible candidates for development and bringing into production by 2011-12.
 - (d) Ideally, the Coal Mines (Nationalisation) Act, 1973 should be amended to facilitate (a) private participation in coal mining for purposes other than those specified and (b) offering of future coal blocks to potential entrepreneurs.
- (ii) Power Sector Reforms must focus on control over aggregate technical and commercial losses of state power utilities. Only financially healthy state power utilities can sustain the growing Central and State Public Sector Units (PSUs) and provide the needed comfort on payment security to attract private investment in the power sector at internationally competitive tariffs. To control AT&C losses the Committee recommends that the existing Accelerated Power Development and Reform Programme (APDRP) be restructured to ensure energy flow auditing at the distribution transformer level through automated meter reading, geographical information system (GIS) mapping of the network and consumers and separation of feeders for agricultural pumps.

Power Sector Reforms must focus on control over aggregate technical and commercial losses of state power utilities.

Investment in developing the MIS that can support full energy audit for each distribution transformer is essential to reform and reduction in AT&C losses. This will fix accountability and provide a baseline which is an essential prerequisite to privatisation. The revised APDRP would provide incentives to SEBs linked to performance outcomes and would also include incentives to staff for reduction in AT&C losses. The Committee also recommends that a liberal captive and group captive regime foreseen under the Electricity Act 2003 be realised on the ground. India's liberal captive regime would not only derive economic benefits from availability of distributed generation but also set competitive wheeling charges to supply power to group captive consumers. This will pave the way for open access to distribution networks. This will facilitate private generation that limits its interface with the host utility to merely use of the distribution network for a fee and thus can be realised even before AT&C losses are reduced. However, to achieve these objectives, the Committee feels that it is essential to separate the cost of the pure wires business (carriage) from the energy business (content) in both transmission & distribution. Electricity Act 2003 recognises such separation for the transmission sub-segment. Separation of content from carriage in the distribution sub-segment, however, is foreseen only through the provision of open access. The wires business within the distribution sub-segment is also a natural monopoly and must be regulated as proposed under (iii) (e) below. Further, introduction of ABT and the upgrading of State Load Despatch Centres to the technological level of Regional Load Despatch Centres will have to be realised.

- (iii) **Reduce Cost of Power:** In terms of purchasing power parity, power tariffs in India for industry, commerce & large households are among the highest in the world. A number of measures are suggested to reduce cost of power.
 - (a) The Government Policy should seek to ensure that all generation & transmission projects started in the 11th Plan & beyond should be competitively built on the basis of tariff based bidding under a prescribed price cap.
 - (b) Where a cost plus regime cannot be avoided and the payments are guaranteed by the Government of India (GOI) the internal rate of return on total capital employed should bear a reasonable relationship to the long-term government bond coupon at the time of approval.
 - (c) Government should seed the capital markets to develop market based instruments that effectively extend the tenure of debt

available to power projects to say 20 years. This will reduce the capacity charge in the earlier years and spread it more evenly over the life of the project.

- (d) Standardise the unit size and invite global tenders for 20 to 30 units to get substantial bulk discount.
 - (e) Distribution should be bid out on the basis of a distribution margin or paid for by a regulated distribution charge determined on a cost plus basis including a profit mark up similar to that paid under (b) above.
- (iv) **Rationalise Fuel Prices:** Relative prices play the most important role in choice of fuel and energy form. They are thus the most vital aspect of Integrated Energy Policy that promotes efficient fuel choices and facilitates appropriate substitution. In a competitive set up, the marginal use value of different fuels, which are substitutes, is equal at a given place and time and the prices of different fuels at different places do not differ by more than the cost of transporting the fuels. Then the resulting inter-fuel choices would be economically efficient.

Prices of different fuels should not be set independently of each other. As a general rule, all commercial primary energy sources must be priced at trade parity prices at the point of sale. This means FOB price for products for which the country is a net exporter and CIF price for which it is a net importer. This principle is extremely relevant for the petroleum sector wherein bulk of the crude is imported and India is fast becoming a net exporter of petroleum products. The only legitimate alternative to trade parity prices in the petroleum sector is to permit full price competition at the refinery gate and the retail level. To provide a cushion against the volatility of prices on the international market, FOB or CIF prices, can be set on the basis of median prices over a month or three months.

Coal prices should ideally be left to the market and trading of coal, nationally and internationally, should be free. Only a competitive free market can do an efficient job of price determination. A

Prices of different fuels should not be set independently of each other. As a general rule, all commercial primary energy sources must be priced at trade parity prices at the point of sale.

competitive market requires that there are multiple producers and that there are no entry barriers to new producers or to imports. Steps to achieve these objectives for the coal market are summarised in paragraph (i) above. Pending the creation of such a competitive market independent regulation of coal prices becomes essential. Natural Gas is a non-tradable commodity in the absence of significant investments in pipelines or, alternatively, in liquification, cryogenic shipping & regasification. Thus the natural gas price can be determined through competition among different producers (this presumes multiple sources and a competitive supply-demand balance) or independently regulated on a cost plus basis including reasonable returns (where competing supply sources are absent and/or demand exceeds available supply). Another option could be to price gas on a net-back-basis. Should a scenario wherein gas becomes 15%-20% of

A consistent application of polluter pays principle or consumer pays principle should be made to attain environmental objectives at least cost.

India's energy mix materialise by 2031-32; some 60% to 80% of the gas supply would be used for power generation. This would mean that beyond the level of gas consumption in the fertiliser, petrochemical, automotive and domestic sectors gas must compete with coal, the key alternative for power generation. A competitive coal market is thus important for setting a proper price of natural gas on a net-back-basis. An alternative to pricing domestic gas could be the net realisation of the domestic natural gas producer after investing and getting a return on the infrastructure needed to make the natural gas tradable across borders. Central and State taxes on commercial energy supplies need to be rationalized to yield optimal fuel choices and investment decisions. Relative prices of fuels can be distorted if taxes and subsidies are not equivalent across fuels. The equivalence should be in term of effective calorie. In other words they should be such that producer and consumer choices as to which fuel and which technology to use are not affected by the taxes and subsidies.

Environmental taxes and subsidies, however, are levied to affect choices. Differential taxes can be justified here if they appropriately reflect environmental externalities. A consistent application of polluter pays principle or consumer pays principle should be made to attain environmental objectives at least cost.

- v. Energy Efficiency and Demand Side Management : Lowering energy intensity of GDP growth through higher energy efficiency is key to

meeting India's energy challenge & ensuring its energy security. India's energy intensity of growth has been falling and is about half what it used to be in the early seventies. Currently India consumes 0.19 kilogram of oil equivalent per dollar of GDP expressed in purchasing power parity terms. This is equal to the energy intensity of the OECD and better than the 0.21 kilograms of China, 0.22 kilograms of the US and a World average of 0.21. However, there are several countries in Europe at or below 0.12 with Brazil at 0.14 and Japan at 0.15. Thus, clearly there is room to improve and energy intensity can be brought down significantly in India with current commercially available technologies.

India would need to and must succeed in achieving much lower energy intensity compared to its current level. Lowering energy intensity through higher efficiency is like creating a virtual source of untapped domestic energy. It may be noted that a unit of energy saved by a user is greater than a unit produced, as it saves on production losses, as well as transport, transmission and distribution losses. Thus a "Negawatt", produced by reducing energy need saves more than a Megawatt generated. The Committee feels that upto 25 percent reduction in India's energy intensity is possible over current levels.

Efficiency can be increased in energy extraction, energy conversion, energy transportation, as well as in energy consumption. Further, the same level of service can be provided by alternate means requiring less energy. The major areas where efficiency in energy use can make a substantial impact are mining, electricity generation, electricity transmission, electricity distribution, pumping water, industrial production processes, haulage, mass transport, building design, construction, heating ventilation & air conditioning, lighting and household appliances. As the Indian economy opens up to international competition, it would have to become more energy efficient. This is well demonstrated by India's steel & cement industry. However, the Committee recommends the following policies, some of which can be implemented through voluntary targets undertaken by industry associations as opposed to through external dictates and enforcement.

- (a) The Petroleum Conservation Research Association (PCRA) should be merged with Bureau of Energy Efficiency (BEE) that is seen as an autonomous statutory body under the Energy Conservation Act. The merged entity should endeavour to achieve financial independence through energy savings it helps generate & may also tap financial support from key industry players with an interest in India's energy sector.

- (b) Increase coal use efficiency in power generation from the current average of 30.5 percent to 39 percent for all new plants.
 - (c) Require a least cost planning approach providing level playing field, in the very least, to Negawatts and Megawatts so that regulators permit same return on a watt saved as on the investment needed to supply an additional watt.
 - (d) Promote urban mass transport, freight movement by railways, and energy efficient vehicles. Enforce minimum fuel efficiency, standards for all vehicles.
 - (e) Force the pace of energy efficiency improvement in energy using appliances and equipment and provide incentive which give substantial rewards to the firm which first commercialises equipment that exceeds energy efficiency target.
 - (f) Enforce truthful labelling with major financial repercussions if equipment fails to deliver stated efficiencies. In extreme cases resort to black listing of errant suppliers at consumer information web sites and for government procurement.
 - (g) Promote minimum life cycle cost purchase instead of minimum initial cost procurement by government and public sector.
 - (h) Annual audits must include energy audits for all specified energy intensive industries and industries with a turnover exceeding say Rs.100 crores.
 - (i) Establish benchmarks of energy consumption for all energy intensive sectors.
 - (j) Disseminate information, support training and reward best practices with national level honours in energy efficiency & energy conservation.
 - (k) Institute specialisations in energy efficiency/energy conservation in all technical colleges and commence certification of such experts.
- (vi) Augmenting Resources: India's energy resources can be augmented till 2031-32 by exploration to find more of coal, oil and gas, or by recovering

a higher percentage of the in-place reserves. Developing the thorium cycle for nuclear power and exploiting non-conventional energy, especially solar, offer possibilities for India's energy independence beyond 2050. At a growth rate of 5% in domestic production, currently extractable coal resources will be exhausted in about 40 years. However, only about 45% of the potential coal bearing area has currently been covered by regional surveys. Further, it is felt that both regional as well as detailed drilling can be made more comprehensive. Covering all coal bearing areas with comprehensive regional & detailed drilling could make a significant difference to the estimated life of India's coal reserves. Finally, India's extractable coal resources can be augmented through in-situ coal gasification which permits using coal deposits which are at greater depth or not easily extracted by conventional methods. Similarly extracting coal bed methane before and during mining can augment the country's energy resources. Again, enhanced oil recovery and incremental oil recovery technologies can improve the proportion of in-place reserves that can be economically recovered from abandoned/depleted fields. Finally, isolated deposits of all hydro carbons including coal may be tapped economically through sub leases to the private sector.

- (vii) Role of Hydro and Nuclear: It is seen that even if India succeeds in exploiting its full hydro potential of 150,000 MW, the contribution of hydro to the energy mix would be around 5-6%. Similarly, even if a 20-fold increase takes place in India's nuclear power capacity by 2031-32, the contribution of nuclear energy to India's energy mix is also, at best, expected to be 5-6%. Though its contribution to energy requirement is small, hydro electricity's flexibility and suitability as a peaking power make it valuable. Moreover, hydro development especially storage schemes are critical for India as India's per capita water storage is the lowest among all its comparators. Creating such storages is critical to India's water security, flood control and drought control. Nuclear, on the other hand, theoretically offers India the most potent means to long-term energy security. India has to succeed in realising the three-stage development process described in the main report and thereby tap its vast thorium resource to become truly energy independent beyond 2050. Continuing support to the three-stage development of India's nuclear potential is considered essential.

- viii **ROLE OF RENEWABLES** : From a longer-term perspective and the need to maximally develop domestic supply options as well as the need to diversify energy sources, renewables remain important to India's energy sector. It would not be out of place to mention that solar power could be an important player in India attaining energy independence in the long run.

Even with a concerted push of 20-fold increase in capacity, renewables can account for around 5-7% of India's energy mix by 2031-32. While this is small, the distributed nature of renewables can provide many social benefits. Subsidy for renewables may be justified on several grounds. A renewable energy source may be environmentally benign. It may be locally available making it possible to supply energy earlier than a centralized system. Grid connected renewables could improve the quality of supply and provide system benefits by generating energy at the ends of the grid where otherwise supply would have been lax. Further, renewables may provide employment and livelihood to the poor. However, the subsidies should be given for a well-defined period or upto a well-defined limit and should be linked to outcomes (energy generated), and not just outlays (capacity installed).

The Committee's approach to policy for promoting renewables is to link incentives to outcomes as far as possible. Even when a capital subsidy is needed, it should be linked to outcomes. Power Regulators must create alternative incentive structures such as mandated feed-in-laws or differential tariffs to encourage utilities to integrate wind, small hydro, cogeneration etc. into their systems. A subsidy could also be given in the form of a Tradable Tax Rebate Certificates (TTRC) based on energy generated. The rebate claim becomes payable depending upon the amount of electricity/energy actually certified as having been supplied.

An annual renewable energy report should be published providing details of actual performance of different renewable technologies at the state and national level. This would include actual energy supplied from different renewable options, availability, actual costs, operating and maintenance problems etc. It should also report on social benefits, employment created, women participation and empowerment. Policies for promoting many specific alternatives are suggested in the main text. These include fuel wood plantations, bio-gas plants, wood gasifier based power plants, solar thermal, solar water heaters, solar photovoltaics, bio-diesel and ethanol.

It is also recommended that Indian Renewable Energy Development

Agency Ltd (IREDA) be converted into a national refinancing institution on the lines of NABARD/National Housing Bank (NHB) for the Renewable Energy Sector. IREDA's own equity base can be expanded by the financial institutions of the country instead of continuing the current system of GOI support.

- (ix) Ensuring Energy Security: India's energy security, at its broadest level, has to do with the continuous availability of primary commercial energy at an affordable price. Reducing energy requirement and increasing energy use efficiency are the most important measures to increase energy security. However, it is still necessary to recognise that India's growing dependence on energy imports increases uncertainty regarding availability of energy at affordable prices. How do we deal with this supply risk? The threat to energy security arises not just from the uncertainty of availability and price of imported energy, but also from the possible disruption or shortfalls in domestic production. Supply risk from domestic sources, such as from a strike in Coal India or Railways, also needs to be addressed. Even if there is no disruption of supply there can be the market risk of a sudden increase in oil price. Again, even when the country has adequate energy resources, technical failures may disrupt the supply of energy to some people. Generators fail, transmission lines trip or oil pipeline may spring a leak. One needs to provide security against such technical risks. Risks can be reduced by reducing the requirement of energy by increasing efficiency in production and use of energy; by substituting imported fuels by domestic fuels; by diversifying fuel choices (gas, ethanol, orimulsion tar sands etc.) and supply sources; and by expanding domestic energy resource base. Risks can also be dealt with by increasing ability to withstand supply shocks; ability to import energy and face market risk; and providing redundancy to address technical risks.

The policy recommendation include maintaining a strategic reserve for 90 days of oil imports and/or buying options for emergency supplies from neighbouring large storages such as those available in Singapore. The Committee, however, felt that obtaining equity oil, coal and gas abroad, do not represent adequate strategies for enhancing energy security beyond the fact that they help diversify supply sources. In contrast, pipelines for importing gas do enhance security of supply if the supplying country makes a major investment in the pipeline. The most critical elements of our energy security, however, remain the measures suggested herein to increase efficiency, reduce requirements and augment the domestic energy resource base.

- (x) Boosting Energy Related R&D: India would find it increasingly harder to

import the required commercial energy as India's share of the incremental world supply of oil & gas could be as high as 20% since its demand is growing faster than that of industrialised nations. Research and Development (R&D) in the energy sector is critical to augment our energy resources, to meet India's long-term energy needs, to attain energy independence, to promote energy efficiency and to enhance our energy security. R&D requires sustained and continued support over a long period of time.

Energy related R&D has not got the resources that it needs. India needs to substantially augment the resources for energy related R&D and to allocate these strategically. To take an innovative idea to a commercial application involves many steps. Basic research leading to a fundamental breakthrough may open up possibilities of applications. R&D is needed to develop the concept and to prove its feasibility. This needs to be followed up by a working model at laboratory scale. Scaling up to a pilot project follows if the economic potential looks attractive keeping in mind cost reductions that could be achieved through better engineering and mass production. Demonstration project, economic assessment and further R&D to make the new technology acceptable and attractive to customers is required before commercialisation and diffusion can take place. Some key policy initiatives relevant to energy related R&D are detailed below:

- (a) A National Energy Fund (NEF) should be set up by levying a cess of 0.1% of the turnover of all companies engaged in the field of primary/secondary energy production whose annual turnover exceeds Rs. 100 crores. At 2004-05 turnover levels, this should collect Rs. 500 to Rs. 600 crores per year. In order to encourage the firms to do their own R&D a rebate of upto 80% of this cess may be given to firms for R&D carried out in-house. The R&D priorities have to be based on a strategic vision which is frequently updated. The NEF should periodically commission and fund such studies.
- (b) A number of technology missions should be mounted for developing near commercial technologies and rolling out new technologies in a time bound manner. These include coal technologies (wherein India should take a lead) for efficiency improvement; in-situ gasification; IGCC and carbon sequestration; solar technologies for thermal and photovoltaics; bio fuels such as bio-diesel and ethanol; bio-mass plantation and wood gasification and community based bio-gas plants.

- (c) Coordinated research and development of all stages of the innovation chain to reach a targeted goal such as in the departments of atomic energy and space research are suggested for more efficient industrial plant, machinery & processes, efficient appliances, hybrid cars, super batteries, nuclear technologies related to thorium and fusion, gas hydrates, and hydrogen production, storage transport and distribution.
- (d) The NEF could provide R&D funding in support of applications, innovative new ideas, fundamental research etc. to researchers in different institutions, universities, organisations and even individuals working independently.
- (xi) Household Energy Security - Electricity and Clean Fuels for All: One of toughest challenge is to provide electricity and clean fuels to all, particularly rural populations; considering the poor paying capacity, the limited availability of local resources for clean cooking energy and the size of the country and its population. Yet, given the fact that women and the girl child carry most of the burden of the drudgery of gathering fuel wood, agricultural wastes and animal dung and also bear the brunt of the indoor air pollution; the urgency to meet the challenge should be high, if we are to achieve universal primary education for girls, promote gender equality and empower women. The considerable effort spent on gathering the bio-mass and the cow-dung & preparing the same for use is not priced into the cost of such energy. These fuels create smoke and indoor air pollution and are inconvenient to use. They have adverse impact on the health of people, particularly women and children. Easy availability of a certain amount of clean energy, required to maintain life, should be considered as a basic necessity. Energy security at the individual level means to ensure supply of such lifeline energy need. India cannot be energy secure if her people remain without secure supply of energy at affordable cost. Even if one assumes that some 30% of India's households are unable to pay for a lifeline electricity consumption of 30 units/month and a loss level of about 40% in delivering these 30 units, the total need for free electricity is about 7% of the current generation. At zero cost to the consumer, this translates into a subsidy burden of about Rs. 9,500 crores a year assuming the infrastructure is built under RGGVY. This burden would reduce over time as 8% GDP growth is expected to reduce poverty at a rate that exceeds population growth. Similarly, if one

assumes that the same 30% of Indian households cannot pay for a lifeline consumption of 8 cylinders of gas per annum while another 20% can only pay for 25% of the cost of supply of such lifeline consumption of gas; the subsidy burden amounts to about Rs. 34,000 crores annually at Rs. 450/cylinder. Again, this subsidy burden would reduce over time with economic growth. The foregoing demonstrates that a well-directed subsidy programme targeted at the intended beneficiary is not unaffordable for a resurgent

India. The benefits in empowerment, health, environment and reduced pressure on deforestation and hence the water table and soil erosion are well worth the cost – even without considering the benefits from the likely increase in productivity of rural India. The top 5% of India's households could pay for this subsidy through a cess on their incomes or a more widely distributed cess on consumption could fund this subsidy burden. It is pointed out that even currently over 60% of the estimated subsidy burden is being funded, although the benefits do not reach the intended beneficiaries due to poor targeting. The real issue is to target the subsidy programme well and ensure that those falling outside the subsidy net pay the full cost of supply. A well-targeted subsidy regime may only marginally raise the current subsidy burden. A system of lifeline tradable entitlements delivered through smart debit cards could potentially be the answer. In addition to the above subsidy other actions are also needed.

- (a) Finance a large scale socio-economic experiment to operate community sized bio-gas plants as a commercial enterprise either by a community cooperative or by a commercial entrepreneur, as such bio-gas plants can meet the need for clean cooking energy of a sizable segment of the rural population.
- (b) Even with subsidies for clean fuel, it may not be easy to reach clean fuels to the poor and they may continue to use fuelwood. As part of the above programme, improve the efficiency of domestic chullahs & lanterns from the prevailing 10-12% to 20-25% which is easily attainable. Couple this to improving ventilation in the cooking area of the dwellings.
- (c) To reduce drudgery of those who still need to gather fuel, village woodlots within one kilometer should be developed. To develop sustainable energy supply, Women's groups can form co-operatives for developing and managing fuel wood or oil seed plantations with the same efforts that they put in searching and gathering fuel wood today. Provide finance through self-help

groups to transform women, who are today energy gatherers into micro-entrepreneurs engaged in rural energy markets and energy management.

- (d) Generate electricity through wood gasifiers or burning surplus biogas from the community bio-gas plants. Such distributed generators may be able to reach electricity to villages sooner than the grid and may be connected to the grid with a feed-in tariff as and when it reaches the villages. This will encourage such local generation, as people would not wait for the grid. Cover such distributed generation together with the local grid under the subsidy scheme of RGGVY. Formulate a tariff policy for such distributed generation for both household and productive use including agriculture.
 - (e) For setting up of off-grid generation facilities in rural areas, organised sector can be encouraged to adopt rural community/communities in their areas of operation.
- (xii) Enabling an Environment for Competitive Efficiency: Apart from pricing policies, an environment that allows multiple players in each element of the energy value chain to compete under transparent & level terms is essential to realising efficiency gains within the energy sector. Currently the Energy Sector is dominated by large Public Sector Companies and some sub-sectors have natural monopoly characteristics potentially offering economies of scale. Given this ground reality, independent & informed regulation becomes essential to realising competitive efficiency at least till markets develop and mature. Such regulation must in the very last ensure that:
- (a) The regulatory responsibility/functions of the State are separated from the Ministries that control the Public Sector Units that dominate the energy sector; and
 - (b) Till competitive markets emerge, independent regulators should fix prices or price caps to mimic competitive markets based on principles summarized in para (iv) above.
- (xiii) Climate Change Concerns: Concern for the threat of climate change has been an important issue in formulating the energy policy. Even though India is not required to contain its GHG emissions, as a signatory to the UN Framework Convention on Climate Change and a country where the impact on its poor due to climate change could be serious, this policy has

suggested a number of initiatives that will reduce the green house gas intensity of the economy. These are

- Energy efficiency in all sectors
- Emphasis on mass transport
- Active policy on renewable energy including bio-fuels and fuel plantations
- Accelerated development of nuclear and hydro-electricity
- Technology Missions for clean coal technologies
- Focussed R&D on many climate friendly technologies

CHAPTER-8

Estimation of Energy Requirements

8.0 Energy Use: Current Position and Scenarios

8.1 Current Position

8.1.1 The share of fossil fuel in the current primary fuel-mix of the country is dominant as coal, oil and gas together account for around 65 per cent. Share of renewables, including large hydro, is 34 per cent and around 1 per cent is nuclear. The current per-capita energy use in the country is around one-third the global average and one-ninth that of OECD countries. The energy intensity of the national growth process is 0.20 MMT0E/USD/PPP1billion whereas the global average is 0.24 MMT0E/USD PPP 1 billion, thereby demonstrating that the Indian economy consumes a somewhat lesser amount of energy per unit of output than the global average. However, this picture would change were the unit of output to be reflected in market determined exchange rates. The latter comparison would not be reflective of the correct status since it is well accepted that market determined exchange rates do not capture the true domestic purchasing power of the currency. On this issue, the Inter Governmental Panel on Climate Change (IPCC), which uses market-determined exchange rates, needs to review its position in order to create a level playing field.

8.2. Past Growth Trends

8.2.1 During the previous decade (1991-2001), total primary energy has grown at an annual average rate of 3.6 per cent whereas primary commercial energy growth has been higher at an annual average rate of 5 per cent. Non-commercial energy, however, grew at a lower rate of 1.3 per cent per annum during the decade. The growth rate of electricity generation was 5.5 per cent per annum.

8.3. Scenarios for 2021-22, 2051-52 and 2100

8.3.1 For estimating future economic output, energy use and electricity generation, it has been assumed that the annual average growth rates of the previous decade of GDP, energy use and electricity generation would continue upto 2021-22. Thereafter, upto 2051-52, three scenarios (pessimistic, likely and optimistic) for each of these growth rates have been assumed. In the pessimistic scenario, one-half of the growth rate assumed upto 2021-22 (pessimistic) has been taken; in the likely scenario,

two-third of the growth rate assumed upto 2021-22 (likely) has been taken; and in the optimistic scenario, the same growth rate as assumed upto 2021-22 (optimistic) has been taken. Further, it has been assumed that population will stabilize at 1.6 billion in 2051-52. Energy use and electricity generation for 2100 has been assumed at the same level as that estimated for 2051-52, with only inter-se changes taking place in the fuel-mix and the fossil fuel consumption remaining more or less at the same level as it was in 2001-02. Energy efficiency is expected to increase by a factor of 2 during the second half of the 21st century, thus taking care of additional requirement of energy.

8.3.2 Trends indicate that global energy consumption is increasing at an annual average rate of 1.7 per cent with growth rates in developing economies around double that level. In that case, during the 50 years upto 2051-52 global energy consumption should become 2.32 times the 2001-02 base level. However, as per some estimates, the trend growth rate of 1.7 per cent per annum is expected to continue upto 2030 whereby global energy consumption in 2030 should be 1.66 times the base level. Thereafter, it could stabilize at around twice the base level by 2051-52. Accordingly, the country's share in global energy consumption will rise from the 2001-02 level of 4.4 per cent to 6.36 per cent in 2021-22, 7.6 (pessimistic), 9.0 per cent (likely) and 12.8 per cent (optimistic) by 2051-52 and should remain at that level upto 2100.

8.3.3 Scenarios for the fuel-mix for 2021-22, 2051-52 (pessimistic, likely and optimistic) and 2100 presented in Tables-I to VII have been built using the heuristic method.

8.4 Energy Shifts

8.4.1 From the scenarios presented in Table-I to Table-VII it becomes increasingly evident that the future energy mix would witness at least three major shifts. First, from a relatively homogeneous one to that which is more diverse; second, from finite resources such as fossil fuel to increasing use of new and renewable energies; and third, from primary energy use to energy carriers. Electricity and alternate fuels belong to the latter category of energy carriers.

8.4.2 An inference that can be drawn with a relatively high degree of confidence is that new and renewable energy sources will dominate the country's energy scene in the future and the biomass- solar-hydrogen economy should be firmly in place sometime by the second half of the 21st century unless fusion deployment makes a wide appearance. Renewable energy is not expected to increase its share in the fuel-mix in any significant manner at least.

8.4.3 Upto 2051-52 as under the likely and optimistic scenarios its share is expected to increase to 39.23 and 53.13 percent respectively. Percentages, perhaps, might not reflect the true magnitude of change as in quantum terms the increase is from the 2001-02 level of 146.73 MMTOE to 710 MMTOE (likely) and 1360 MMTOE (optimistic) in 2051-52. Even by 2021-22, 275 MMTOE is expected from renewables, i.e., nearly double the 2001-02 level.

8.4.4 As per the scenarios presented in this statement, the fossil fuel economy should peak sometime around the mid 21st century. The normative scenario presented by IPCC for arresting GHG emissions suggests that such peaking would take place around 2030. However, for the economic potential of the country to be realized any suggestion of bringing forward the fossil fuel peaking date through affirmative action or otherwise could have a deleterious effect on the economy. Firstly, new and renewable energy systems are not firmly in place to start playing an effective dominant role in the medium-term. Second, it would take sometime more for R&D effort so that the new systems could match the existing ones in reliability, quality and cost. The scenarios presented in this statement have factored in the maturity of fusion technology sometime during the second-half of the century. In the event fusion technology does not appear on the horizon by that time, the quantum of energy attributed to this technology in 2100 would have to be met out of the biomass-solar assets.

8.4.4 The issue is not whether scenarios faithfully mimic the future, but rather what policy options could emanate from them. In that way, scenarios facilitate a better understanding on how present concrete actions could impact the future. We need to first appreciate the future role and content of new and renewable energies in the context of overall energy supply before a response thereto can be determined. The road map for the energy future is sought to be.

Table I : Selected key parameters for 2001 – 2002 and scenarios for 2021-22 and 2051 under 3 different cases, as also for 2100

SI. No.		World 2001 -02	2001-02 India	2021-22 India	2051-52 India	2100 India
1	Population (billion)	6.0	1.0	1.2	1.6	1.6
2	GDP (billion USD)	34,000	416.55	1350	3300 - I 4400 - II 7700 - III	14400 31100 143000
3	Primary energy consumption (MMTOE)	10,000	437.69	890	1520 – I 1810 - II 2560 - III	1520 1810 2560
4	Per capita energy consumption (MTOE)	1.64	0.437	0.74	0.95 - I 1.13 - II 1.60 - III	0.95 1.13 1.60
5	Electricity generation (TWh)	14000	560	1630	3670 - I 4800 - II 8100 - III	3670 4800 8100
6	Per capita Electricity generation(kWh)	2326	540	1360	2290 - I 3000 - II 5060 - III	2290 3000 5060

Table II: Fuel-mix in 2001-02 and scenario for 2021-22 (in MMTOE)

2001-02			21-22	
		%		%
Fossil Fuel-Total	285.81	65.30	595	66.85
Coal	151.63	34.64	250	28.09
Oil	107.46	24.55	220	24.72
Gas	26.72	6.10	125	14.04
Non-Fossil Fuel -Total	151.88	34.70	295	33.15
Nuclear	5.15	1.18	20	2.25
Renewable -Total	146.73	33.52	275	30.90
Hydro	7.57	1.73	30	3.37
Biomass	139.02	31.76	238	26.74
Solar	0	0.00	neg	0.00
Wind	0.14	0.03	2	0.22
Biofuel	0	0.00	5	0.56
Grand Total	437.69	100.00	890.00	100.00

Table III: Scenarios for fuel mix for 2051-52 under 3 different cases, as also for 2100 (In MMTOE)

	51-52 (I)		51-52 (II)		51-52(III)		2100	
	1520	%	1810	%	2560	%	2560	%
Fossil Fuel -Total	1000	65.79	1100	60.77	1200	46.88	300	11.72
Coal	400	26.32	400	22.10	400	15.63	150	5.86
Oil	300	19.74	350	19.34	400	15.63	75	2.9
Gas	300	19.74	350	19.34	400	15.63	75	2.93
Non Fossil Fuel -Total	520	34.21	710	39.23	1360	53.13	2260	88.28
Nuclear	80	5.26	100	5.52	140	5.47	400	15.63
Renewable-Total	440	28.95	610	33.70	1220	47.66	1860	72.66
Hydro	50	3.29	50	2.76	50	1.95	50	1.95
Biomass	305	20.07	455	25.14	700	27.34	700	27.34
Solar	60	3.95	76	4.20	430	16.80	1070	41.80
Wind	10	0.66	10	0.55	10	0.39	10	0.39
Biofuel	15	0.99	19	1.05	30	1.17	30	1.17
Grand Total	1520	100.00	1810	100.00	2560	100.00	2560	100.00

Table IV: Scenarios for installed capacity for electricity generation for 2021 and 2051-52 under 3 different cases

	21-22	51-52(I)	51-52(II)	51-52(III)	2100
Fossil -Total	88.10	173.4	198.8	223.2	36.3
Coal	62.50	100	100.00	100.0	31.9
Oil	1.80	2.4	2.80	3.2	0.4
Gas	23.80	71	96.00	120.0	4.0
Non-Fossil-Total	52.40	143.60	215	476.8	663.7
Nuclear	20.00	80	100.00	140.00	400
Renewable-Total	32.36	63.60	115	336.8	263.6
Hydro	30.00	50	50.00	50.00	50.0
Biomass	0.40	1.8	27.5	138.4	101.8
Solar	0.00	1.8	27.5	138.4	101.8
Wind	2.00	10.0	10.0	10.0	10.0
Grand Total	140.50	317	413.8	700	700

CHAPTER-9

Table V: Scenarios for installed capacity for electricity generation for 2021 and 2051-52 under 3 different cases

	2001-02	21-22	51-52 (I)	51-52(II)	51-52(III)
Generation(TWh)	560	1630	3670	4800	8100
PLF - 60%	106500	310000	700000	910000	1540000
PLF - 70%		266000	600000	780000	1320000
PLF - 80%		233000	520000	680000	1156000

Table VI: Scenarios for hydrogen production for 2051-52 and 2100

	51-52	2100
Hydrogen (MMTOE)	5	100
Electricity(TWh)	15.40	308

Table VII: Scenarios for carbon-di-oxide emission related to energy, total CO₂ emissions and per capita emissions for 2021-22 and 2051-52 under 3 different cases, as also for 2100

Year	Emissions from energy (MMT)	Total Emissions (MMT)	Per Capita (MT)
2001-02	943	1572	1.6
2020-21	1964	3273	2.7
2051-52 (I)	3300	5500	3.4
2051-52(II)	3630	6050	3.8
2051-52(III)	3960	6600	4.1
2100	990	1650	0.6

Organisational and Funding Requirements

The “Mission-2022” as the name itself suggests, has to be taken up and implemented with some sort of missionary zeal. Since the mission has a definite purpose i.e. 'to make India Energy Independent' and a definite time frame i.e 15 years, it can be treated and executed like any other project. Like other projects, it will start with a definite mission, generate activities involving a variety of human and non-human resources all directed towards fulfillment of the mission and will stop once the mission is fulfilled.

9.1 Suggested Organisational Structure

A project is one entity and is normally entrusted to one responsibility center while the participants in the project may be many. A project calls for team work-the team is again constituted of members belonging to different disciplines, organizations, departments and even ministries. Considering the uniqueness of the 'Mission-2022', it is suggested that a five-tier organization headed by the Prime Minister is created to take up the mission as a project. It has been depicted in Fig-1.

The five-tier organization will be headed by the PM. It will have its National Headquarters at New Delhi with 5 Zonal Headquarters, 28 State Headquarters and 604 District Headquarters. However, the staffing and budget for zonal/State and District Headquarters may vary as per the requirements. All the Mission offices shall be staffed with competent persons having extensive knowledge of energy sector. The preference shall be given to Certified Energy Auditors and Energy Managers and those who have hands on experience in Power, Oil and Coal sectors. The CEA/CEMs working with Public Sector undertakings and Government organizations can be taken on deputation. The existing set-up of energy sector need not be disturbed except for the fact that MEERE shall be formed as soon as possible, as recommended in clause 2.3.1.

9.2 Funding Requirements

The government has been spending huge amount of money since Independence to create infrastructure for our energy needs. The funding required for 'Mission-2022' will be miniscule in comparison and the returns will be enormous. If the government allocates even 0.1 % of its budget to take up this mission, it will suffice. This is nothing in comparison to the budgetary allocations of up to 30 %, which are being made to meet the energy demand.

CHAPTER-10

Time Bound Action Plan

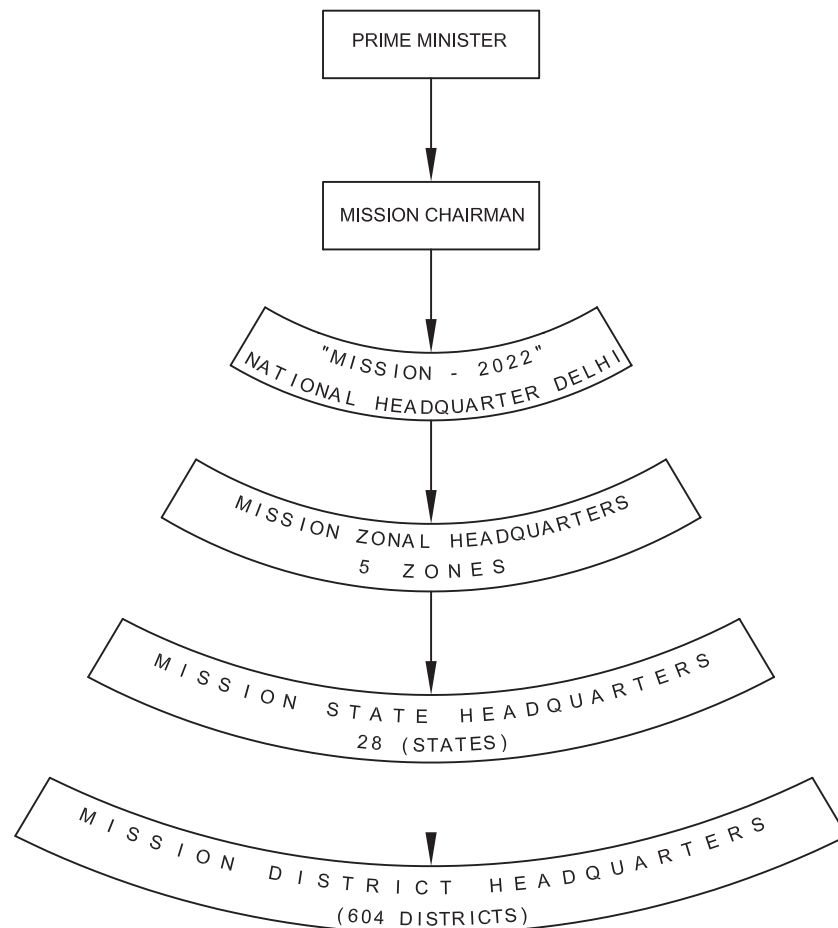
After tenure at Rashtrapati Bhawan which saw him being hailed as 'People's President' and he used to exhort the nation to set sights for a Superpower Status, Dr. Kalam in his farewell address to the nation, on 24th July 2007, had spoken at length about his dream to see India as a developed nation by 2020. Referring to the question by a young school girl from Harayana, asking him why India could not be a developed country before 2020, he said, "This reflects how the desire to live in a developed India has entered into the minds of the youth. The same feelings are echoed by over 15 lakh youth."

There is a need to arouse similar sentiments when we set a 'Time Bound Action Plan' to achieve Energy Independence. All concerned Ministries and Agencies have to work together in mission mode and try to achieve the target even before the scheduled date of 15th August 2022. With concerted efforts and close coordination, it is quite possible to achieve this goal.

The Time Bound Action Plan has been prepared with tentative start and finish dates for the carious activities needed to be carried out. The time frame given needs to be updated and fine tuned regularly. An elaborate project plan on Primavera/ MS Projects software with sub-activities needs to be prepared and monitored in the same manner as any time bound project is executed. The latest project management techniques need to be adopted. Here, the use of IT enabled services can help a lot.

The various activities mentioned in the Action Plan will also have to be allotted different weightage for regular assessment of the real progress made.

The Action Plan elaborates the various activities carried out for preparation of this document. The effective start date has been considered as 15th August'07 and effective finish date has been considered. The activities are grouped sector-wise for easy monitoring and updating. As per the requirements of the mission,, more activities may be added in future. The names of the agencies/ministries responsible for the activity have also been mentioned.



PROPOSED ORAGANISATION STRUCTURE FOR "MISSION - 2022"

FIGURE -1

“MISSION - 2022” TIME BOUND ACTION PLAN

EFFECTIVE START DATE : 15th August,2007

FINAL FINISH DATE : 15TH August2022

Sl. NO.	ACTIVITY DESCRIPTION	Start Date	Finish Date	Action By
1	FINALISATION OF “VISION DOCUMENT” ON HOW INDIA CAN BECOME ENERGY INDEPENDENT BY THE YEAR 2022		14.07.07	
1.1	CIRCULATION OF DRAFT-I FOR COMMENTS FROM CONSULTANTS/ OFFICIALS/MANUFACTURERS/ INDUSTRY	Started	01.03.07	
1.2	COMPILATION OF COMMENTS AND PREPARATION OF DRAFT-II	02.03.07	15.03.07	
1.3	RECIRCULATION OF DRAFT-II	16.03.07	15.04.07	
1.4	RECOMPILATION OF COMMENTS & PREPARATION OF DRAFT-III	16.04.07	15.05.07	
1.5	RECIRCULATION OF DRAFT-III FOR FINAL COMMENTS & APPROVAL	16.05.07	15.06.07	
1.6	PREPARATION & PRINTING OF FINAL "VISION DOCUMENT"	16.06.07	15.07.07	
1.7	PUBLICITY /MOBILISATION OF SUPPORT/ SEEKING CONSENT	16.07.07	14.08.07	
1.8	LAUNCH OF"MISSION -2022"	On 15th August,2007		
2	TRAINING/ RESOURCES MOBILISATION FOR IMPLEMENTATION			
2.1	CONSTITUTION OF CENTRAL ACTION COMMITTEES	16.09.07	15.11.07	GOI
2.2	CONSTITUTION OF STATE LEVEL COMMITTEES	16.09.07	15.11.08	GOI
2.3	FINALISATION OF MONITORING METHOOLOGY	16.09.07	15.11.08	GOI
2.4	STATE LEVEL TRAINING PROGRAMMES FOR MONITORING	16.09.07	15.12.08	GOI
2.5	REPORTING & CORRECTIVE ACTIONS	16.09.07	15.12.08	GOI

Sl. NO.	ACTIVITY DESCRIPTION	Start Date	Finish Date	Action By
3.	ACTION PLAN FOR ENERGY EFFICIENCY			
3.1	ACTIONS AS SUGGESTED BY IAEMP			
a.	SETTING-UP OF 'ENERGY COMMISSION'	16.09.07	15.09.07	GOI
b.	FORMATION OF 'MEERE'	16.09.07	15.02.08	GOI
c.	POINTS RELATED TO OTHER MINISTRIES	16.09.07	15.02.08	GOI
d.	ACTIVE SUPPORT FOR IMPLEMENTATION OF ELECTRICITY ACT,2003	16.08.07	15.08.08	MOP
e.	INCORPORATING ENERGY EFFICIENCY AT DESIGN STAGE BY FOLLOWING NATIONAL BUILDING CODE	01.04.08	31.03.09	GOI
f.	PROMOTION OF "GREEN BUILDINGS	16.02.08	15.02.18	MNRE STATE GOVT. MOEF
g.	DEVELOPMENT OF CDM PROJECTS	01.09.07	31.03.07	MOEF
h.	SETTING UP OF ENERGY CONSERVATION FORCE	01.04.08	31.10.08	GOI
i.	HUMAN RESOURCES DEVELOPMENT	01.04.08	01.07.08	BEE
j.	INTRODUCTION OF SMALL ENERGY SAVING SCHEMES	01.04.08	01.07.08	
k.	INTRODUCTION OF MANDATORY TECHINCAL AUDIT	01.04.08	31.07.10	GOI
l.	BAN USE OF ELECTRICITY FOR LOW GRADE HEATING AND DRYING	01.04.08	31.07.10	BEE
m.	BAN MANUFACTURE OF ENERGY INEFFICIENT ITEMS	01.04.08	31.07.10	BEE
n.	INTRODUCTION OF MANDATORY PROVISIONS FOR EMBODIED EMISSION RATING	01.04.08	31.07.10	MOEF
3.2	ACTIONS AS PER EC ACT,2001	16.08.07	15.02.08	BEE
a.	ESTABLISHMENT OFENERGY CONSERVATION FUND	01.11.07	15.11.07	BEE
b.	ESTABLISHEMNT OF APPELLATE TRIBUNAL	16.08.07	15.02.08	BEE
c.	APPOINTMENT OF ADJUCATING OFFICERS	01.11.07	31.03.08	BEE

Sl. NO.	ACTIVITY DESCRIPTION	Start Date	Finish Date	Action By
d.	ACTIVATING STATE DESIGNATED AGENCIES	16.08.07	31.03.08	BEE
e.	NOTIFICATION OF ALL DESIGNATED CONSUMERS	16.08.07	31.03.08	BEE
f.	ACCREDITATION OF ENERGY AUDITORS	16.08.07	31.03.08	BEE
g.	NOTIFICATION FOR APPOINTMENT OF ENERGY MANAGERS	16.08.07	31.03.08	BEE
h.	ACCREDITATION OF LABS FOR TESTING AND CERTIFICATION	16.03.07	14.08.22	BEE
i.	S & L PROGRAMME	STARTED	01.06.08	BEE
j.	INFORMATION DESEMINATION	STARTED	14.08.22	BEE
k.	EDUCATIONAL CURRICULUM	16.09.07	31.03.08	BEE
l.	INTERNATIONAL CO-OPERATION PROGRAMMES	STARTED	14.08.22	BEE
m.	ENERGY CONSERVATION BUILDING CODE	01.04.08	31.03.09	STATE GOVTS.
n.	TRAINING, R & D, PILOT PROJECTS, DEMONSTRATION PROJECTS	01.04.08	14.08.22	BEE
o.	NORMS FOR PROCESSES AND ENERGY CONSUMPTION STANDARDS.	16.07.08	31.03.08	BEE
3.3	ACTIONS AS PER INTEGRATED ENERGY POLICY-2006			
a.	INCREASING EFFICIENCY OF COAL-BASED POWER PLANTS			
i	Technology acquisition for fuel conversion efficiency improvement	01.04.08	01.03.09	MOP
ii	Fixing of certified fuel conversion efficiency	01.09.07	31.03.08	MOP
b.	SHIFTING FREIGHT TRAFFIC TO RAILWAYS	01.04.08	14.08.22	GOI
i.	Construction of dedicated freight corridors.	01.04.08	14.08.22	GOI
ii.	Dismantling of CONCOR monopoly.	01.04.08	31.03.09	GOI
c.	PROMOTION OF URBAN TRANSPORT	STARTED	31.03.15	GOI
d.	PROMOTION OF FUEL			

Sl. NO.	ACTIVITY DESCRIPTION	Start Date	Finish Date	Action By
	EFFICIENCY VEHICLE	01.04.08	14.08.22	GOI
e.	IMPLEMENTING TIME OF DAY TARIFF	STARTED	31.03.09	GOI
f.	FACILITATING GRID INTERCONNECTION FOR COGENERATORS	01.09.07	31.03.08	MOP
g.	IMPROVING EFFICIENCY OF MUNICIPAL WATER PUMPING	1.04.08	31.03.10	BEE
h.	TWO TIME ZONES FOR DAYLIGHT SAVINGS	1.04.08	31.03.09	BEE
i.	ADOPTION OF LEAST COST PLANNING AND POLICY APPROACH			
i.	Electricity Sector	01.04.08	31.03.09	MOPNG
ii.	Oil Sector	01.04.08	31.03.09	MOPNG
j.	ANNULISED LIFE CYCLE BASED PROCUREMENT	STARTED	31.03.09	BEE / GOI
k.	ENCOURAGEMENT TO ESCOs			
i.	Payment Security Mechanism	01.04.08	31.03.09	GOI
ii.	Alternate Business Modes	01.04.08	31.03.09	GOI
iii.	Tax Benefits as producers of 'Negawatts'	01.04.08	31.03.09	GOI
iv.	Institutional framework for independent monitoring and evaluation.	01.04.08	31.03.09	GOI
4.	ACTION PLAN FOR RENEWABLE ENERGY			
4.1	ACTIONS AS SUGGESTED BY DR KALAM			
a.	ALTERNATE FUELS (HYDROGEN, BIO, SYNTHETIC)	01.04.09	14.08.22	GOI
i.	Production			
ii.	storage			
iii.	distribution			
iv.	delivery			
v.	appliances			
b.	Green Initiative for Future Transport (GIFT)	01.04.10	14.08.22	GOI

Sl. NO.	ACTIVITY DESCRIPTION	Start Date	Finish Date	Action By
c.	Green Initiative for Power Generation(GIP)	01.04.10	14.08.22	GOI
d.	IC Engine -Electric Hybrid Vehicles	01.04.09	31.03.15	GOI
e.	NRE Systems/Devices for Rural Areas	STARTED	14.08.22	MNRE
f.	NRE Systems/Devices for Industrial, Commercial and Urban Applications	STARTED	14.08.22	MNRE
g.	Distributed Energy Systems	STARTED	14.08.22	MNRE
h.	Energy Recovery	STARTED	14.08.22	MNRE
i.	SPV Materials, cells, Modules, Systems	STARTED	14.08.22	MNRE
j.	Resource Survey, Assessment and Mapping	01.04.08	31.03.11	MNRE
4.2	ACTIONS AS PER INTEGRATED ENERGY POLICY-2006			
a.	MINI HYRDO			
i.	Survey of Potential Sites	01.04.08	31.03.09	MNRE
ii.	Tradable Tax Rebate Certificates	01.04.08	15.07.08	GOI
b.	WIND POWER	STARTED	15.08.15	
c.	BIO-DIESEL			
i.	Tax Benefits	01.04.08	15.07.08	GOI
ii.	Minimum Support Price	01.04.08	15.07.08	GOI
d.	ETHANOL	STARTED	15.08.08	GOI
i.	Minimum Purchase Price			
ii.	Tax Exemption			
iii.	Environmental Premium through TTC			
e.	FUELWOOD PLANTATION	01.04.08	31.03.09	MOEF
i.	Co-operatives for Tree Plantations	01.04.08	31.03.09	MOEF
ii.	Land on Lease to Co-operatives	15.09.07	31.03.09	MOEF
f.	BIO GAS PLANTS			MOEF
g.	SOLAR THERMAL	01.04.08	31.03.10	MOEF
i.	Water Heating			
ii.	Power Plants			
5.	ACTION PLAN FOR COAL SECTOR			

Sl. NO.	ACTIVITY DESCRIPTION	Start Date	Finish Date	Action By
5.1	ACTIONS AS PER INTEGRATED ENERGY POLICY-2006			
a.	ALLOCATION OF COAL BLOCKS	01.04.08	31.03.09	MOC
b.	AMENDMENT OF COAL MINES (NATIONALISATION) ACT, 1973	01.11.07	01.03.08	GOI
c.	IN-SITU COAL GASIFICATION	01.04.08	31.03.11	MOC
d.	COAL BED METHANE	01.04.08	15.03.15	MOC
e.	DETAILED SURVEY OF COAL BEARING AREAS	01.04.08	15.03.15	MOC
f.	LEASING OF ISOLATE COAL DEPOSITS TO PUT SECTOR	01.01.08	30.11.08	MOC
6.	ACTIONS PLAN FOR POWER SECTOR			
6.1	ACTIONS AS PER INTEGRATED ENERGY POLICY-2006			
a.	RESTRUCTURING OF APR	15.01.08	15.07.08	MOP
i.	GIS MAPPING OF NETWORK & FEEDERS	15.01.08	31.03.08	MOP
ii.	SEPARATION OF FEEDERS FOR AGRICULTURAL PUMPS	01.04.08	31.03.09	MOP
iii.	INCENTIVE TO SEBS/STAFF FOR REDUCTION IN AT & CLOSSES	01.04.08	31.03.09	MOP
b.	OPEN ACCESS REGIMENT	01.04.08	31.03.09	MOP
c.	INTRODUCTION OF ABT	01.04.08	31.03.10	MOP
d.	UPGRADATION OFSLC'S	01.04.08	31.03.10	MOP
e.	REDUCTION IN COST OF POWER GENERATION	01.04.08	31.03.11	MOP
7.	ACTION PLAN FOR OIL & GAS			
7.1	ACTIONS AS SUGGESTED BY DR KALAM			
a.	BIO-DIESEL	STARTED	31.03.22	GOI
7.2	ACTIONS AS PER INTEGRATED ENERGY POLICY-2006			
a.	INCREMENTAL OIL RECOVERY TECHNOLOGY	01.04.08	31.03.15	MOPNG
b.	LEASING OF ISOLATED OIL FUELS TO PVT. SECTOR	01.04.08	31.03.09	MOPNG

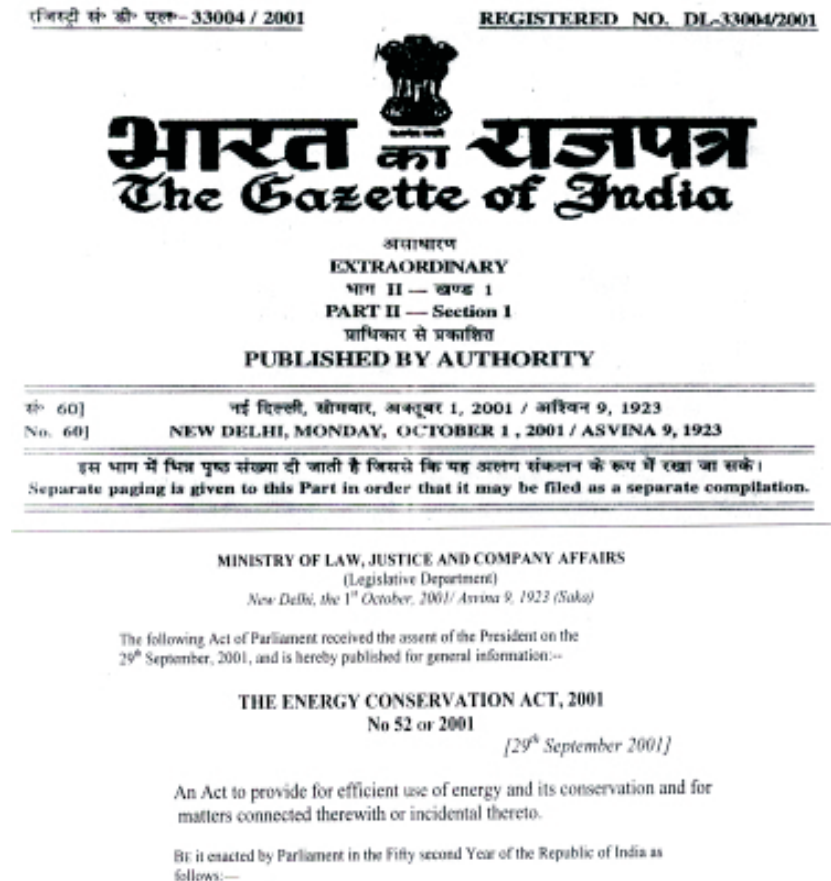
Sl. NO.	ACTIVITY DESCRIPTION	Start Date	Finish Date	Action By
8.	ACTION PLAN FOR HYDRO ENERGY			
8.1	ACTIONS AS PER INTEGRATED ENERGY POLICY-2006			
a.	DEVELOPMENT OF STORAGE SCHEMES	01.04.08	31.03.15	GOI
9.	ACTION PLAN FOR NUCLEAR ENERGY	01.04.08	31.03.22	
9.1	ACTIONS AS SUGGESTED BY DR KALAM			
a.	DEVELOPMENT OF THORIUM REACTORS	01.04.08	31.03.15	GOI
b.	NUCLEAR FUSION RESEARCH	01.04.08	31.03.15	GOI
9.2	ACTIONS AS PER INTEGRATED ENERGY POLICY-2006			
a.	DEVELOPMENT OF THORIUM CYCLE	01.04.08	31.03.15	GOI
10.	ACTION PLAN FOR ENERGY R & D			
10.1	ACTIONS AS SUGGESTED BY DR KALAM			
a.	DEVELOPMENT OF HIGH EFFICIENCY CNT BASED PHOTO VOLTAIC CELLS.	01.04.08	31.07.18	GOI
b.	NANO TECHNOLOGIES	01.04.08	31.03.18	GOI
10.2	ACTIONS AS PER INTEGRATED ENERGY POLICY-2006			
a.	ESTABLISHMENT OF NATIONAL ENERGY FUNDS	01.04.08	31.10.08	GOI
b.	LAUNCHING OF TECHNOLOGY MISSIONS	01.04.08	31.10.08	GOI

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4. The Report of Working Group on Energy Policy (1979)
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9. Dr APJ Abdul Kalam's address on 14.12.2005 on the occasion of National Energy Conservation Day
10. Excerpts from Chapter-13, 'Thermodynamics Energy and Entropy' by Late Dr.G.P.Chatterjee, Published by Steel Authority of India Limited
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13. Inputs from Mr. Mahesh Kumar & other members of NPC Yahoo group aipnpc@yahoogroups.co.in

EXHIBITS & ANNEXURES

EXHIBIT - A



There is need to Prepare the status of implementation
of the Energy Conservation Act, 2001

EXHIBIT - B

संविदा सं-०१-२००७-०००१-०७ REGISTERED NO. DL-(7)64/6697/2003-07

भारत का राजपत्र
The Gazette of India

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PUBLISHED BY AUTHORITY

फं 31] नई दिल्ली, सोमवार, माई 29, 2007 / ज्येष्ठ 8, 1929
No.31] NEW DELHI, TUESDAY, MAY 29, 2007 / JYASTHA 8, 1929

इस भाग में विभिन्न पृष्ठ संख्या दी जाती है बिना किसी कि यह अलग संकलन के रूप में छापा जा सके।
Separate paging is given to this Part in order that it may be filed in a separate compilation.

MINISTRY OF LAW AND JUSTICE
(Legislative Department)

New Delhi, the 29th May, 2007/Jyastha 8, 1929 (Saka)

The following Act of Parliament received the assent of the President on the 28th May, 2007, and is hereby published for general information:—

THE ELECTRICITY (AMENDMENT) ACT, 2007
No. 26 of 2007 [28th May, 2007.]

An Act further to amend the Electricity Act, 2003.

Be it enacted by Parliament in the Fifty-eighth Year of the Republic of India as follows:—

1. (1) This Act may be called the Electricity (Amendment) Act, 2007.
(2) It shall come into force on such date as the Central Government may, by notification in the Official Gazette, appoint.

There is need to Prepare the status of implementation of the Electricity Act, 2003 as amended in May, 2007

EXHIBIT - C

OPINION

Prepaid lift service

Money saving and an interesting way to conserve petrol and reduce congestion on the roads

Background

The mass rapid transport system in India is virtually non-existent, except in the cities of Mumbai, Kolkata and Delhi. As a result, the pressure on the use of personal vehicles is constantly increasing. To quote The Bulletin of Energy Efficiency Vol. 2, Issue 8, June 2003:

"The share of private vehicles (2-wheelers and cars) to the total number of registered vehicles increases from 88 percent in 1977 to 93 percent in 1997. Energy consumed per passenger (calculated by a car) can be as high as 10 times that of a bus. Poor maintenance of roads in urban areas hinder the smooth movement of traffic, leading to congestion, which also increases energy consumption."

However, providing mass transport systems is not very cost effective for the nation. Instead, we should attempt to utilize the personal vehicles to increase the low occupancy rate and reduce energy intensity in the vehicles. This may sound difficult or impossible but with the right kind of a system in place this can be realized.

What is a Prepaid Lift Service?

Almost all of us have tried "carpooling" with colleagues/friends. However, because of its own limitations, carpooling has not succeeded as a concept.

We often travel alone, which is not only expensive but also unsafe. Many a times, we travel to far away places on our own. We would have preferred to take somebody with us if the person was known and agreed to share the petrol expenses. Aimed at the same

time another person is traveling alone in the same direction. But both are unaware about each other's program, since there is no service that could make it possible to know each other's plans. Similarly, when the day was an all traveling everyday in the same direction without a chance of sharing a car vehicle.

This lack of information forces us to use our own vehicle, which not only increases personal expenses incurred but also vehicle traffic on the road leading to pollution and traffic jams and increase in travel time.

If we could think of a very easy and convenient way to utilize prepaid lift would not only reduce our petrol bills but also help in reducing congestion and pollution besides reducing chances of accidents. The most interesting aspect which people generally unknown to each other will have a chance to meet for personal and business affairs. It is needless to mention here that only those commuters who have a vehicle and a mobile will be allowed to join.

How It Can Be Done

Thanks to the IT revolution and mobile telephone services, it is now possible to start a "Prepaid lift service".

It will operate like this:

- Initial awareness will be created about the service and benefit in prepaid lift services will be fixed.
- Those who are interested to avail the service to give and take lift will be asked to submit their normal travel routes and travel destinations. The

members shall give an undertaking that at least for 3 days in a week they will avail the service (either give or take lift).

- Pick-up points (like bus stops) will be identified.
- With the help of a mobile service provider, information will be exchanged about who is looking for lift in a particular direction and who is interested in giving lift.
- Both the persons will send the message to the mobile service provider as agreed both the parties have met. This is also necessary from the safety point of view.
- The mobile company will credit debit the amount in the respective personal account and charge a certain percentage to both.
- The mobile service provider will maintain the record and adjust the amount in the mobile bill.

Benefits

- Benefit to members
 - Reduced fuel bill.
 - Reduced maintenance cost of vehicle.
 - Reduced stress.
 - Ready help in case of breakdown / failure.
 - Chance for fixing personal and business affairs.
- Benefit to mobile service provider
 - Increased direct revenue.
 - Indirect revenue from the operation of Prepaid lift service.
- Benefit to the country
 - Reduction in fuel import bill.
 - Increased employment potential.
 - Reduced road congestion and pollution.
- Other benefits
 - Likely benefits to the Insurance Companies.
 - Likely social benefits in the area when people are becoming more and more individualistic and self-centered.

Courtesy: S.K. Sood, Ex-Gen. Comptroller & Engineer, Shree Shree Automobiles Pvt. Ltd.

MINISTRY OF POWER

ANNEXURE - 1

NOTIFICATION

New Delhi, the 12th March, 2007

S.O.394 (E) -- Whereas the Central Government, in consultation with the Bureau of Energy Efficiency, having regard to the intensity or quantity of energy consumed and the amount of investment required for switching over to energy efficient equipment and capacity of industry to invest in it and availability of energy efficient machinery and equipment required by industry, is satisfied that some users or class of users of energy may be specified as designated consumer;

And whereas, the Schedule of the Energy conservation Act, 2001 (52 of 2001), specifies certain energy Intensive Industries and other establishments as designated consumers;

And whereas, the Central Government considers it necessary to provide that only those energy intensive industries and other establishments having annual energy Consumption as indicated against each industry or establishment by the Central Government from time to time, shall be notified as designated consumers;

Now, therefore, in exercise of the powers conferred by the clauses (e) and (f) of Section 14 of the Energy Conservation Act, 2001 (herein referred to as said Act), the Central Government, in consultation with the Bureau of Energy Efficiency, hereby alters the list of Energy Intensive Industries and other establishments specified in the Schedule to the said Act, namely:--

1. Thermal Power Stations-30,000 metric tonne of oil equivalent (MTOE) per year and above
 2. fertilizer-30,000 metric tonne of oil equivalent (MYOE) per year and above
 3. Cement-30,000 metric tonne of oil equivalent (MTOE) per year and above
 4. Iron and Steel-30,000 metric tonne of oil equivalent (MTOE) per year and above
 5. Chlor-Alkali-12,000 metric tonne of oil equivalent (MTOE) per year and above
 6. Aluminium- 7,500 metric tonne of oil equivalent (MTOE) per year and above
 7. Railways—
- (a) the electric traction Sub-section (TSS) in each Zonal Railway having maximum energy consumption as per the table given below:-

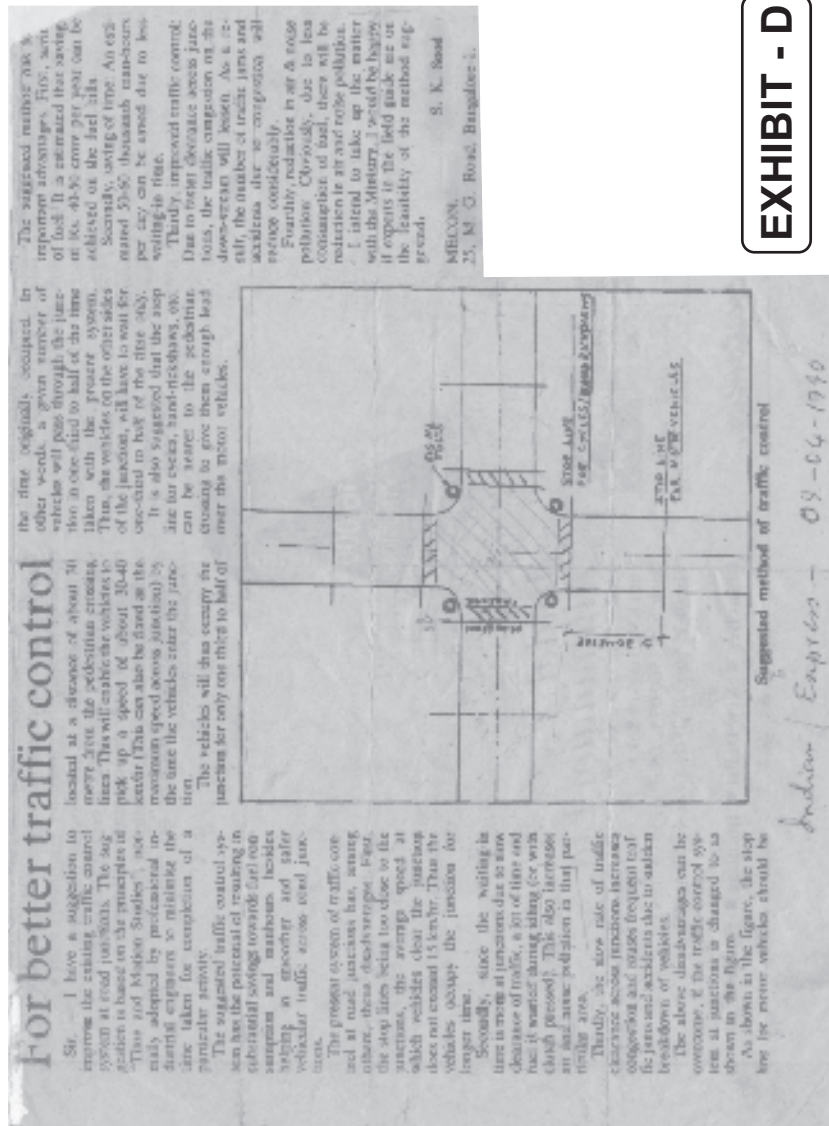


EXHIBIT - D

TABLE

Railway Zone	List of TSS
Central Railway	Wardha
Eastern Railway	Titagarh
East Central Railway	Koderma
East Coast Railway	Simhachalam North
Northern Railway	Narcla
North Central Railway	Mathura
Southern Railway	Avadi
South Central Railway	Krishna Canal
South Eastern Railway	Balichak
South Western Railway	Bangarapet
South East Central Railway	Bilaspur
Western Railway	Makarpur
West Central Railway	Bina

- (b) the diesel loco shed in each Zonal Railways as per table given below:--

TABLE

Railway Zone (1)	Loco Shed (2)
Central Railway	Kalyan
Eastern Railway	Undal
East Central Railway	Palratu
East Coast Railway	Vishakapatnam
Northern Railway	Ludhiana
North Central Railway	Jhansi
North Eastern Railway	Gonda
Northeast Frontier Railway	New Guwahati
North Western Railway	Abu Road
Southern Railway	Erode
South Central Railway	Kazipeth
South Eastern Railway	Kharagpur
South East Central Railway	Raipur
South Western Railway	Hubli
Western Railway	Vatva
West Central Railway	New Katni Jn.

- (c) all six production units i.e. Integral Coach Factory (ICF), Rail Coach Factory (RCF), Chittaranjan Locomotive works (CLW), Diesel Locomotive Works (DLW) and Rail Wheel Factory (RWF);
- (d) workshops on Indian Railways having total annual energy consumption of 30,000 MTOE or more.
8. Textile-3,000 metric tonne of oil equivalent (MTOE) per year and above
9. Pulp and Paper-30,000 metric tonne if oil equivalent (MTOE) per year and above

Note : 1 The energy conversion value given in the table below shall be used for working out annual energy consumption in terms of metric tonne of oil equivalent.

TABLE

1kWh	860 kilocalories (kcal)
1 kg. Coal/Coke	Gross calorific Value as per supplier's (coal Company's) latest certificate
1 kg. Charcoal	6,900 kcal or as per supplier's latest certificate
1 kg. Furnace Oil/Residual Fuel Oil/Low Sulphur Heavy Stock-NAPHTHA	10,050 kcal (density=0.9337 kg/litre) or as per supplier's latest certificate
1 kg. High Speed Diesel	11,840 kcal (density=0.8263 kg/litre) or as per supplier's latest certificate
1 kg. Petrol	11,200 kcal (density=0.7087 kg/litre) or as per supplier's latest certificate
1 kg. Kerosene	11,110 kcal (density of SKO=0.7782 kg/litre) or as per supplier's latest certificate
1 kg. Liquefied Petroleum Gas	12,500 kcal or as per supplier's latest certificate
1 M ³ Natural Gas	8,000-10,500 kcal (Actual calorific value as per supplier's latest certificate will be considered in case of non-issue of certification by the supplier, average of the range 8,000-10,500 kcal/M ³ will be considered)

ANNEXURE - 2**GOVERNMENT OF ANDHRA PRADESH**
ABSTRACTENERGY – Energy Conservation Measures – Certain instructions – Orders – Issued.**GENERAL ADMINISTRATION (SB) DEPARTMENT**

Dated : 02-01-2007

G.O.Ms.No.1**ORDER:**

There is a server power shortage in the state of Andhra Pradesh where the available supply is short of present demand. Several studies have established that considerable saving in energy consumption and thereby reduction in demand can be achieved provided power is utilized efficiently and responsibly. In this hour of crisis, Government expects that all citizens adopt measures to ensure that power is indeed used responsibly. In this regard it is important that the Government in its various articulations, takes a lead in setting an example in this regard.

2. In the above context, following instructions are issued to all Secretaries to Government. Heads of Departments, state Public Sector Undertakings, Corporations, Statutory and non-statutory Corporative Bodies, Urban and Local Bodies, Government funded and controlled Institutions and other Government Establishments. These instructions will come into effect immediately.

- 1) **Usage of Air Conditioners :** Usage of Air-Conditioners is prohibited till 1st March, 2007. However, Hospitals, Scientific Laboratories, Manufacturing Processing Units requiring control environment, Central Computer Server / Processors are exempted.

All the Central Air Conditioner systems. Compressors and circulating pumps / draft fans in the cooling towers should be disconnected from the switch boards and the blowers are to be used for air circulation. Room air conditioner should be disconnected from the switch board.

After 1st March, 2007, the central Air-Conditioners can be operated such that the web bulb temperature at the ventilator in the rooms shall not be less than 23 deg C and for the window air conditioners, the thermostat should be set at warmer side of temperature and setting of central conditioners should be in “low cooling mode”.

Other Fuels or Waste material or by product used as Fuel

Gross Calorific Value as per the certification from a National Accreditation Board for Testing and Calibration Laboratories (NABL) accredited laboratory or Central Government laboratory or State Government laboratory or Government approved laboratory provided the fuel sampling for assessing the calorific value has also been carried out by the concerned laboratory.

For the purpose of this table,--

- (i) 1 kg. of Oil Equivalent: 10,000 kcal\
- (ii) 1 Metric Tonne of Oil Equivalent (MTOE): 10×10^6 kcal
- (iii) In case of coal, petroleum products and other fuels, in absence of the supplier's certificate (due to non-issue by the supplier), the gross calorific value of the above fuels will be considered as per Test Certificate from a National Accreditation Board for Testing and Calibration Laboratories (NABL) Accredited Laboratory or Central Government Laboratory or state Government Laboratory or Government recognized Laboratory provided the fuel sampling for assessing the calorific value has also been carried out by the concerned laboratory.

Note : 2 For the purpose of declaring energy intensive industry or any other establishment specified in the Schedule to the Act, the limit of annual energy consumption in terms of metric tonne of oil equivalent shall be reviewed every three years with effect from the date of publication of this notification.

Note : 3 The provisions mentioned in this Schedule shall not be applicable to the Ministry or the Department of the central Government dealing with Defence, Atomic Energy, Space, Internal Security or Undertaking or Boards or Institutions under the control of such Ministries or Departments.

[F.No.10/13/2002-EM]

HARISH CHANDRA, Jt.Secy.

All the water coolers should be disconnected from the switch board till 1st March, 2007.

- 2) **Refrigerators :** The Refrigerators available in the offices shall not be run or shall be sent to Government Dispensaries, Hospitals where they can be put to better use.
- 3) **Artificial Lighting :** To the extent possible, natural daylight should be used and artificial light may be used only to the extent necessary. In the chambers fitted with more than 3 – 4 lighting fixtures, only that minimum be used which would not result in any constraint in normal work. All employees are responsible to ensure that lights, fans, etc. are switched off when not in use.

Areas which do not require high illumination, such as corridors, staircases, porticos etc. inspected and unnecessary light fixtures disconnected.

- 4) **Lifts :** During the peak hours i.e., 1 minutes before and after the opening and closing of the office hours, all the lifts may be in operation but during the rest of the period 50% of the lifts shall be stopped. A sticker should be pasted at each lift showing the duration of its operation.
- 5) **Water supply :** The care taker in-charge of water pumping the Government offices shall ensure that pumps are switched off when the over head water tank are filled to 3/4th capacity. During the course of the day, the pump should normally not be operated. The person incharge for pumping will be responsible for any over flow of water.
- 6) **Avoiding Luxury use :** Use of illuminated sign boards, name boards in the camp offices, Guest houses, illumination and decorative displays is totally banned with immediate effect. In the alternative reflecting paint sign boards (Radium sticker sign boards) can be used as necessary. There shall be no unnecessary decorative light displayed. Use of electrical kettle and other appliances for making tea and coffee are best avoided. The use of decorative light is prohibited during any public / Government celebrations till 31st March, 2007.
- 7) **Energy Saving measures :** The voltage at the output terminal of the distribution transformer shall be set at 220 volts in the large office complexes. Since these offices are fitted with the energy efficient lighting, 2-3 % reduction in the supply voltage will not affect the performance, which is likely to result in 4–6% energy saving.
- 8) **Urban and Rural Local Bodies street lighting :** The switching on and off of all the street lights can be advanced since the duration of the day will be increasing from 22nd December to 21st June. The urban local bodies and

panchayats should ensure 15 minutes reduction in illumination time each fortnight starting from 1st January 2007. The good practice of switching off the street lights at around 10.00 P.M. whenever it is adopted shall be continued. Illumination in the parks and gardens should be switched off as soon as parks and gardens are closed for public. The streets lights other than those in the artery roads can be switched off on experimental basis on the nights before and after the full moon. Whenever illumination of street light is more, Municipalities should switch off alternative lights and incase of dusk to dawn street lights, the alternative lights should be switched off after 11.00 P.M. in the night.

- 9) **Discipline :** With a more discipline in usage of electricity, 10% energy saving is possible. All employees should inculcate the habit of switching off the lights and fans whenever extent possible. Under any circumstances the lights and fans and other electrical appliances shall be switched off when an employee is leaving the office. Cleaning the fans and light fixtures every fortnight will result in their efficient functioning, higher illumination and help in energy saving.
- 3) The Head of the Office shall take personal interest in ensuring compliance of the above instructions and the employees shall cooperate in this endeavor.
- 4) To ensure that the above instructions are carried out in the true spirit, NEDCAP (Non-Conventional Energy Development Corporation of Andhra Pradesh) which is the State designed agency for energy conservation under Energy Conservation Act 2001 will appoint Voluntary Energy Observers.
- 5) The District Collectors shall identify one or two energy observers in each local area and NEDCAP shall provide financial assistance to meet the out of pocket expenses of the observers.
- 6) All the Heads of Department in the Secretariat shall ensure that the above instructions are strictly complied with by paying personal attention and utmost priority in observance of the above measures of energy saving.

(BY ORDER AND IN THE NAME OF THE GOVERNMENT OF ANDHRA PRADESH)

J. HARINARAYAN
CHIEF SECRETARY TO GOVERNMENT

ANNEXURE - 3

To

All Special Chief Secretaries to Government / Principal Secretaries to Government / Secretaries to Government.

All Departments of Secretariat.

All Head of Departments.

All vice chairman & Managing Directors of all.

Public Sector Undertakings.

All Mayors / Chairmen / Commissioners of all Municipalities / Municipal Corporations / Local Bodies / Zilla parishads.

All District Collectors.

All Registrars of all Universities.

The Registrars of High Court of Andhra Pradesh

Copy to

The Private Secretaries to all Ministers.

A.P. TRANSCO / ALL DISCOMs / NEDCAP.

The Press Secretary to Chief Minister.

The Publicity Cell, Secretariat.

SF.

//FORWARDED : BY ORDER//

SECTION OFFICER

Step by step guide to introduce incentive scheme

1. Appoint a member of your family as 'Home Energy Manager' (HEM) , and offer 1/3rd share of the savings achieved over the last years consumption. (You can self-appoint yourself as 'HEM' for obvious gains!)
2. The job of your 'HEM' should be clearly defined and explained to him as to be the 'conscience keeper of your home on energy matters' and - "to first establish the past year's consumption and then try to bring it down to a lowest possible level as soon as possible and to maintain it at that level"
3. HEM' should start with collecting the past data and maintaining file of energy consumption. We all normally keep record of electricity bills, but LPG Bills are rarely preserved. HEM should start keeping record of LPG and Petrol/Diesel purchased for your home. As a good measure, record of water consumption must also be included. (As a 'side business'!)
4. Next step for 'HEM' will be to estimate average consumption of each type of energy consumed in the previous year.
5. HEM' must make it a habit of taking electricity and vehicle meter readings twice (morning and evening) a day so as to get an idea of the consumption pattern.
6. Next job of HEM will be to compare the ideas as given in clause-3.2.1 for identifying energy wastages and saving opportunities
7. Finally, 'HEM' has to prepare a plan and monitoring schedule to see that energy consumption starts coming down.
8. In the meantime you must keep aside the savings realized assuming that you are continuing with your old habits.
9. At the end of the year calculate the net savings realized and honestly pay 1/3rd of the amount to 'HEM' (or to yourself, if you are the 'HEM'!)
10. Of the remaining amount 1/3rd can be spent on family members(as an incentive to other members to co-operate) while the balance 1/3rd amount should be invested in purchasing energy efficient/lower capacity gadgets.

Similar Steps can be taken in your office. Here 'HEM' will be replaced with 'OEM' i.e. Office Energy Manager. Schools can start similar programme and appoint a 'SEM' i.e. School Energy manager' etc.,

Remember, before you preach others on the importance of energy savings- "Charity begins at Home". Forget the benefits to the nation and to environment, it is YOU who will be benefitted most.

It has to start from you. Did you say it is unnecessary waste of time? But if you have sufficient time to argue with vegetable vendors, domestic helps, coolies, milk and newspaper suppliers to save some petty amount at the cost of the poor people; then you can certainly find time to do this in your home.

THOUGHT PROVOKING ARTICLES / NEWS PAPER CLIPPINGS

“Arrogance of a Switch”

– A persuasive speech to motivate people for adopting electricity saving measures.

(Background Announcement)

Here comes the emperor of “United Kingdom of Electricals” -

(Speaker wearing a mask resembling a Switch with two switches one each in both hands producing sound of steps by switching them ON and OFF alternately)

With a proud and arrogant tone, which sounds like a king addressing his people the speaker begins:

“I am the undisputed king of the electrical world. I am present everywhere. I am omni present & most powerful incarnation of the GOD on earth.

My one signal can start or stop Air conditioners, large motors & even Trains. I control use of more than Rs. 3 lakh crores worth of electricity.

Despite my importance, some people do not even understand me & tend to neglect me. Every time they do so, I surely & severely punish them by way of increased electricity bills, power cuts and erratic supply. I do not forgive. I am not for forgiveness. Let everyone understand this by heart.

I am after all the Emperor of 'United Kingdom of Electricals', my name is SWITCH.”

(Speaker removes his mask and keeps it on the lectern and begins his speech)

Friends,

(Smilingly looking at the Mask he begins his speech)

-Let us forgive him for his arrogance because what is proclaiming is quite true. However, I do not agree with him for his statement that he is found everywhere. It is not very true.

Let me prove him wrong with a real story. I had an employee whose relative had just landed up from a village looking for a job. He was basically an agricultural

worker and looking for a job in the town. I thought that he would be quite useful as a helper. Hence I offered him the job & since he had no other place to stay. I also made temporary arrangements for him to stay in the office. He immediately joined & brought his belongings. I was happy for him.

The next day security guard told me that the new employee had left all the lights ON in the night. Being very conscious about energy conservation, I scolded him & asked him why he didn't switch off the light? Do you know what he said? – Mujhe maloom nahin tha ki light kaise bujhate hain. . (Sir, I did not know how to switch off the lights) Actually he had never seen any switch because in his village nobody had installed a switch, since the power supply was very infrequent & erratic. When the light will come and go there were not able to know. Hence, as an easy way they had simply not put any switch in the circuit.

Friends, this is the case where at least some power was made available to the villages, but most of us do not know the hard fact that as per census 2001, 56% of the rural households do not have access to electricity. 35% of world population without access to electricity is in India (about 58 crores). How this has happened is a matter, which will take hours to discuss.

Why go into the details of how this has happened & who to blame. I would like to tell you what we, as individuals can do. In my opinion this is the only social work in which you don't have to donate any time or money and which can be taken up by anybody from home and which helps the person himself more than anybody else.

There are no sacrifices involved. You have to just identify the 'Ghost Consumers' (Phantom loads like Remotes, Mosquito Mats, Thermostats etc) and make an attempt to understand how each & every electricity-consuming item should be used.

-Do not use your T.V remote for switching off the T.V.- Switch-off from main.

Remote keeps consuming 6 watts of power even if TV is off. It holds good for UPS too which consumes 9 watts for home computers.

-Switch off mosquito mats during daytime. Mosquito mats consume 5 watts

-Install L.E.D lamps of 0.5 watts rating as night lamps, in stair case, outside area lighting, Puja Rooms, where low illumination level will suffice. Remember, so called Zero watts lamp consumes 12-15 watts for the same level of illumination, which can be, achieved with 0.5 watts L.E.D. Lamps.

-Use Compact Fluorescent Lamps (CFLs) for Bed Rooms, kitchen, Toilets, Bath Rooms, etc. CFL are better choice between 2 watts to 15 watts. Beyond that FTL with Electronic Ballast should be used.

-Install 2 nos 20 watts Fluorescent Tube Lights (FTL) with electronic ballasts at

2 opposite walls of the room instead of a single 40 watts Tube light. This way you will have flexibility of switching off one of the .FTL.

-Install 50 watts energy efficient fans with electronic step/ step less regulators/ instead of conventional 70- 80 watt fans with resistance type regulators.

-Plan your work on computers so that you have to keep it ON for minimum hours. This will also be good for your health. Set your monitor to switch off automatically after 5 minutes and CPU after 1 Hr of continuous idle time.

-Maintain a daily record of your Electricity meter reading. This will reveal you many things.

-Switch off Fridge in the winter / cold nights. Fridge consumes 1.2 to 4 units per day depending on size, model, make etc. Bigger fridge will consume more power. For smaller families 80 Litres fridge can be sufficient instead of 165 Litres fridge.

-Introduce incentive scheme in your home/ office. Nominate Energy Manager at your home/school /office. Suggested methodology is given in 'Annexure-3'

-Use solar water heater at home for heating water. Using High quality electricity for hot water generation is not morally correct. If use of solar water heater is not possible go for Gas Geysers. Where electric geyser is unavoidable Pl don't leave it on Thermostat. Electric geyser on thermostat causes standing losses of 1-1.5 units per day.

-Spread the fact about Darkness in the rural areas to as many people as possible. Let them at least feel guilty. One day this guilt feeling will awaken their conscience.

Providing good quality and assured electricity to villagers is in our own interest because it will help substantial increase in demand of electrical and electronic products in the villages resulting in benefit to national economy. Further, the influx of villagers into cities will reduce drastically. In addition, the working hours of villagers will increase which will contribute to our Gross Domestic Products.

The inventor of electric bulb Sir Thomas Alva Edison had once declared “I will make electric light so cheap that only the rich will be able to afford candles.”

Friends, his statement unfortunately has not come true, we have let him down due to our greed to corner all facilities depriving our village brothers of light in their lives.

The least we can do friends (Pointing towards the Mask) is to follow above points to prove him right that he is omnipresent

SAVING CALCULATION BY USE OF SOLAR WATER HEATING SYSTEM (Electricity replacement)

1.0 Before we carry out the saving calculations let us refresh the fundamentals involved.

- What is Kcal?
Kilocalorie (Kcal) is the amount of heat to be added (or removed) to raise (or lower) the temperature of 1Kg water by 1°C.
- What is calorific value?
It is the amount of heat liberated when unit quantity of fuel is burned under standard conditions. The calorific value is measured in Kcal. Calorific values of different fuels are given below:
- What is efficiency of utilization?
The efficiency of utilization for all fuels are not same. The normal efficiencies recorded are:

2.0 Calculations for heating 100 Litres Water from 20°C to 60°C

The formula for calculating total heat required to heat water is

$$Q = m s (t_1 - t_2)$$

Where, Q is the total heat required in kcal

M is the mass in kgs. (100 litres is equal to 100 kgs)

t_1 is the initial temperature (20°C)

t_2 is the initial temperature (60°C)

Let us assume that we have to heat 100 litres of water per day from 20°C to 60° with the use of Electricity. Assuming an overall efficiency of 90%, the electricity consumption works out to:

$$\frac{100 \times 1 \times (60-20)}{0.90 \times 860}$$

$$= 5.2 \text{ kWh (units), say 5 units}$$

Assuming electricity tariff as Rs. 5.0 per unit, the savings in Rupees

$$= \text{Rs. } 5 \times 5 = \text{Rs. } 25 \text{ per day}$$

The savings year for a minimum of 200 days

$$= 300 \times 25 = \text{Rs. } 7,500 \text{ per year}$$

The total savings for industrial / commercial applications will be more since the number of days can be taken as 325 days instead of 200 days

Similarly calculations for other forms of energy like Diesel / Coal / LPG can be done using the respective efficiency factors.

Kind Attention : Builders/Architects/Individuals

Did you know that it is possible to provide electricity saving light fittings and solar water heater without any additional cost to the owner !

How ?

It is just a matter of financial calculations !

Case study for a 3 Bedroom house

Conventional Gadgets					Electricity Saving Gadgets				
Sl. No.	Item	Qty.	Rate (Rs.)	Amount (Rs.)	Sl. No.	Item	Qty.	Rate (Rs.)	Amount (Rs.)
1.	Tubelights-57 W	5	250	1250	1.	T5,Tubelights- 32W	5	750	3750
2.	Ceiling Fans 72W	5	900	4500	2.	Ceiling Fans with step regulator 50W	5	1300	6500
3.	Geysers 2kW	3	4500	13500	3.	Solar Water Heater 200 LPD Capacity.	1	37500	37500
4.	Incandescent/ Decorative/Night Lamps 60/40/12W	20	L.S.	300	4.	L.E.D Lamps with 10 years life	20	L.S.	2000
5.	Total Cost			19,550/- Say 20,000/-	5.	Total Cost			49,750/- Say 50,000/-
6.	Extra Cost			Nil	6.	Extra Cost			30,000/-
7.	Loan installment due to extra cost For 10 years			Nil	7.	Loan installment due to extra cost			400/- month
8.	Avg. Expected reduction in electricity bill			Nil	8.	Avg. Expected reduction in electricity bill			600/- per month
9.	Net monthly savings			Nil	9.	Net monthly savings			200/-
10.	Savings for 10 years			Nil	10.	Savings for 10 years			24,000/-

The above table shows that if we provide electricity saving lighting and solar water heater, we have to spend an extra amount of Rs. 30,000/-. However, if the extra cost is added in the housing finance amount for 10 years period, then the same is recovered by way of savings in electricity bills. In fact, contributing a net cash inflow of Rs. 200/- per month i.e. Rs. 24,000/- over the loan period of 10 years! Additionally, it will help in lower standby power requirement. Plus, it will be your contribution to solve the pertinent electricity shortage and reduction in GHG emission.

Issued in the public interest by : S.K.Sood, e-mail :sunilsolar@yahoo.co.in

Indian Association of Energy Management Professionals

Electricity is costliest but the best form of energy

It is meant to light your home,
-So that your children could study & watch TV

It is meant to run pumps,
-So that we get water to drink & cook food

It is meant to run motors and machines in Industries
-So that we have employment & growth

It is meant to light public places,
-So that we are safe during the nights

It is meant to maintain tele-communication networks
-So that we could exchange information on Internet

It is meant to run Railways
-So that road traffic could be eased

It is meant to run agricultural pumps
- So that farmers could produce food grains for us

Why waste high quality energy called 'ELECTRICITY' to generate hot water to take bath

BE WISE & CONSIDERATE

**HANG YOUR ELECTRIC GEYSER
ADOPT SOLAR WATER HEATER/GAS GEYSER**

“MUNNA BHAI-CEA”

All of us are aware of the reel life character 'Munnabhai- MBBS

How a Munna Bhai is connected to energy ? You will be surprised to find the similarities! See for yourself

Munna Bhai's 'wat' ('wat laga doonga') and electric 'watt' both signify power i. e, muscle power & electrical power!

Both can be used for giving 'Shock Treatment' whenever needed!

Both need 'CIRCUIT' to exist!

Common public is afraid of both of them and does not like to talk about them!

The Governments have failed to tackle both of them!

The only way Electric watt is different then Munna Bhai's wat is that Electric watt has a big brother, called Kilowatt.! Which is thousand times powerful than a watt! And even much more powerful brother called Megawatt which is million times bigger than a watt! May be 'Munnabhai's more powerful brothers have all settled down in Dubai or Pakistan!

Further, Munna Bhai can cure by giving 'Jadoo ki Jhappi' but if the same is tried with electric watt, you had it!!

BEE has produced 4 batches of Certified Energy Auditors (CEAs). Fifth batch will be ready this year but most of them find themselves helpless in utilising their qualification due to the problems with the system. Instead of real CEAs, if there was even a single “Munna Bhai, CEA” then it would have been easy to set right the system in 'Munna Bhai's style. He would have simply asked 'Jab Koi casualty main marne ki halat mein ho to kya form bharna zaroori hai'? (Meaning when the Energy Conservation needs immediate attention, is it necessary to conduct ,painting competitions, TV Shows ,Road Shows etc?) Tackling the establishment in 'Munna Bhai' style is so easy.

May be the time has come to produce a movie with the title ' Munna Bhai CEA'

AWAKENING THE CONSCIENCE

Most of the officers and employees in government offices and establishments can be broadly divided into four broad categories, if we consider two major attributes about their working viz. Honesty and Efficiency. These categories are:

Category –1	:	Honest but Inefficient
Category –2	:	Honest and Efficient
Category –3	:	Corrupt but Efficient
Category –4	:	Corrupt and Inefficient

There are many officers who fall in the first category. They are not corrupt in the usual sense of the word. They do not demand cuts or shares but are reluctant to bring about changes in the system because they want to steer clear of any controversies. Their inefficiency in taking right and bold decisions on the matters being handled by them needs much to be desired. They are also not much bothered to see that the public money is spent wisely.

The second category is probably a miniscule minority. It would be nice to know their names. Here media has to play a role and identify such officers and employees who are not only honest but also do their jobs in the true letter and spirit. But unfortunately, the media in our country believes more in reporting sensational stories rather than in writing about such rare souls.

The third category is better than the first category. Officers belonging to this category work over time and do the job properly but do expect and even demand some “returns”. As long as they spend the money wisely and take their share, it doesn't harm the public.

It is the fourth category, which is causing huge damage to our economy and slowing down our progress. They are the real culprits for all our social evils. They consider it their right to loot the public without giving away anything in return. Having secured a permanent job in the government, they think that they have acquired all rights to do whatever they want. Governments may come and go but these people never change.

Such persons only change when their conscience starts pricking them but by that time it is too late. The social scientists need to develop some method by which the conscience of such persons is awakened faster. Is there a way to do it?

:- Energy Slogans :-*

01. LEAKS MAKE YOUR FUTURE BLEAK
02. ENERGY SERVES YOU THE WAY YOU DESERVE
03. ENERGY MISUSED CANNOT BE EXCUSED
04. SAVE ONE UNIT A DAY, KEEP POWER CUT AWAY
05. THE LESS YOU BURN, THE MORE YOU EARN
06. WHEN IT IS BRIGHT, SWITCH OFF THE LIGHT
07. POWER SAVED IS POWER PRODUCED
08. TODAY'S WASTAGE IS TOMORROW'S SHORTAGE
09. ENERGY EARNS OR SIMPLY BURNS, CHOICE IS YOURS
10. A THING WHICH BURNS NEVER RETURNS
11. CONSERVE & PAY NO PRICE SPEND & PAY A GREAT PRICE

NO ENERGY CONSERVATION KNOW MONETARY LOSS

KNOW ENERGY CONSERVATION NO MONETARY LOSS

Manage Energy Well. To Avoid Damage & Hell.

E	=	m	C ²
Energy	=	money	control conservation

Maximize Energy Conservation !

Minimize Financial Implication ! !

Energy can neither be created nor destroyed

but can be wasted.

*www.energymanagertraining.com

Dr. Kaupp's Corner *

Article - 1

Famous or infamous quote about Energy Conservation in India.

1. There is too much energy conversation instead of energy conservation. Let us walk the talk.
2. "Just" energy audits should be outlawed. What comes after is more important.
3. Why energy efficiency? Look at all the energy efficient nations and how they squander away energy in the name of being efficient. Energy modesty is more important.
4. To BEE or not to BEE, that is the question!
5. The most important objective of BEE is to contribute to the decoupling of economic growth from growth in energy consumption.
6. Energy efficiency is a state of mind and not just a love affair with State-of-the-Art Technology.
7. Claiming twenty years of experience means nothing. It could be one year of experience in making mistakes and nineteen years of repeating those mistakes.
8. An experienced energy auditor working in tandem with a committed and empowered energy manager is a dream team of intellectual sparring partners to reduce energy consumption and costs.
9. Standards and labels inform. They won't necessarily change purchasing decisions.
10. India doesn't have the problem of being inefficient. We have a bandwidth problem where the best and worst possible energy efficiency cases on earth exist side by side, and this is a strange phenomenon in that even the worst seem to survive in the market.
11. The stick and carrot approach of the Energy Conservation Act should not be taken as a public license to offer orange painted sticks in the hope designated consumers will mistake them for juicy carrots.
12. Why do we call this law the Energy Conservation Act? It is an Act to force energy intensive industries to make more profit. There is nothing wrong with that, except that we need this law to punish those who refuse to make more profit.
13. Nothing lasts forever. This Act is an instrument that if successful, will become obsolete in 15 years or whenever market transformation has taken place.
14. An Action Plan is like a shopping catalog. You invite interested parties to "buy" activities and make sure implementation does not stop at the workshop level that discusses how to overcome unimportant and imaginary barriers.
15. A sustainable national energy management strategy is the sum of energy efficiency + energy modesty + renewable energy. It is not about favoring one over the other.
16. Don't be surprised by this world squandering away energy. Our planet is ruled by a neuron controlled sophisticated technology called a "human being" with a miserable energy efficiency of about 12%, consuming the most expensive energy: food! Any power plant does better at 40% on diesel oil. We are an old fashioned design that has not changed for the last 100,000 years except for a reduction in technical losses by radiation and convection through fancy clothing.

Dr. Kaupp's Corner

Article - 2

Five Steps to "Tons of CO₂ Mitigated"

It has become fashionable to calculate tons of CO₂ mitigated by complicated software where the software knows what to do, but the user does not. This is called the black box syndrome. Firms operating machinery which burn carbonaceous fuels (boilers, furnaces) within their premises and are considering either compensating for their CO₂ emissions or reducing their CO₂ emission to claim CO₂ credits can follow a very precise and simple calculation procedure to establish their own CO₂ emissions without having to rely on some mysterious black box calculation and wondering how accurate their results are.

Step 1: Get the Carbon content of one kg of fuel. In case of coal, other solid fuels or natural gas it is best to let a laboratory do this. For commercially traded furnace and boiler oils, suppliers know this number. For LPG the carbon content depends on the weight fraction of propane and butane in LPG.

Step 2: Calculate the CO₂ generated if complete combustion takes place, i.e. all the Carbon of the fuel is burned to CO₂.

Example: Consider a high ash coal with 39.85 % C, and 36.15% ash. One ton of this coal emits at most $0.3985 \times 3.667 = 1.4613$ tons of CO₂.

The factor 3.6667 is derived from the stoichiometric equation that 1 kgmol of Carbon weighs 12 kg and generates 1 kgmol of CO₂ weighing 44 kg (i.e., 44 kg of CO₂ produced per every 12 kg of C burned).

Step 3: Not all Carbon is burned to CO₂. Some remains in the residue or is incompletely burned to CO or is stored as liquid and gaseous CnHm. However, only the Carbon left in the residues is of any significance and should be calculated. Generation of CO and higher hydrocarbons (CnHm) is insignificant. Accounting for them is not improving the accuracy of the calculation since high levels of CO or soot are a sure sign of badly adjusted combustion and should not be considered a business as usual practice.

Step 4: Establish the Carbon remaining in the residues by the Loss Of Ignition test (LOI). This test is standard and often performed on a daily basis in all combustion systems where coal is fired and of course unnecessary for gaseous or liquid fuels. It is in particular a

necessity if excess air is adjusted since reducing excess air will usually increase LOI.

Example: Assume the LOI test revealed 8% Carbon in the residue of the coal. The total mass of residues (including ash and Carbon) can be calculated from the coal's reported ash content and the LOI test results: $0.3615 / (1 - 0.08) = 0.39293$. In other words firing of 1 ton of coal has generated 392.93 kg of residues. This residue contains however 8 % Carbon or $0.08 \times 392.93 = 31.4$ kg. Consequently $31.4 \times 3.667 / 1000 = 0.1151$ tons of CO₂ need to be subtracted because they were not formed.

The final result is $1.4613 - 0.1151 = 1.3462$ tons of CO₂ are emitted.

Step 5: The last step is to multiply this figure by the firm's annual consumption to arrive at the total tons of CO₂ emitted per annum by burning this coal. The uncertainty is changing coal qualities. The LOI changes as well depending on how combustion is controlled. However Step 4 is redundant if oil or gas is burned.

* www.energymanagertraining.com

An e-mail from an Indian working in Japan

To:	sunilsolar@yahoo.co.in
Subject:	Re: Welcome to join IAEMP.
From:	sinha.sumita@jgc.co.jp
Date:	Thu, 12 Oct 2006 15:31:08 +0900

In Japan, there is almost 100 % electrification. They have a very beautiful and reliable system with 100 % power backup all over Japan.

The frequency is 50 Hz in eastern Japan and 60 Hz in Western Japan. So when a train passes from eastern region to western region, it automatically switches from 50Hz to 60 Hz. Japanese technology are way ahead from the world..

Yes, Japanese are also the front runner in solar energy.. you can find many signboard and mast light with sun powered energy.. Also in rural areas almost all the house will have PV panel over the rooftop as a back-up power. which they normally use during night time..

As far as energy efficiency, their technology is again very well advanced..all household items have the label where it indicate how much energy efficient that product is and the cost of the item also depends on the percentage of efficiency. For example, when I was buying freeze, I bought the most energy efficient model although the cost was a bit high I can see the cost of running that freeze in the catalogue...they have this wonderful labeling system for the energy efficient product..

Also in the office, during summer time also all the HVAC's temp will be maintained at 27deg C...and employees are told not to wear Tie and suit during that time..although it is compulsory for other months..and the company save a lot with Thai policy..and also Co2 emission can be reduced...and you know here Japan it is almost 100 % AC in offices as well as in houses..and in country side also..because the winter are too cold here..

Another very good system that I find at least in my office is that during lunch time (we have 1 hr of lunch here) all the lights are automatically off except the panic light..and so is the case with all the toilets /kitchen and other areas where a person switch off the light who used it last..and they are very particular about this..even if it is an office cost..Also at 8.30 PM every day, all lights will be automatically switch off and all HVAC's will be automatically switched off at 7.30 PM.. so any person who are working after 8.30 will switch on his light in his area only.. All those small saving makes Japan so much energy efficient.. And this we can do in India also..

Lets do something together for better future of India..

Sumita Sinha

Food or Fuel

(One tankful of the latest craze in alternative energy could feed one person for a year) By LESTER BROWN

The growing myth that corn is a cure-all for our energy woes is leading us toward a potentially dangerous global fight for food. While crop-based ethanol -- the latest craze in alternative energy -- promises a guilt-free way to keep our gas tanks full, the reality is that overuse of our agricultural resources could have consequences even more drastic than, say, being deprived of our SUVs. It could leave much of the world hungry.

We are facing an epic competition between the 800 million motorists who want to protect their mobility and the two billion poorest people in the world who simply want to survive. In effect, supermarkets and service stations are now competing for the same resources.

This year cars, not people, will claim most of the increase in world grain consumption. The problem is simple: It takes a whole lot of agricultural produce to create a modest amount of automotive fuel.

The grain required to fill a 25-gallon SUV gas tank with ethanol, for instance, could feed one person for a year. If today's entire U.S. grain harvest were converted into fuel for cars, it would still satisfy less than one-sixth of U.S. demand.

Worldwide increase in grain consumption

The U.S. Department of Agriculture reports that world grain consumption will increase by 20 million tons this year, roughly one percent. Of that, 14 million tons will be used to fuel cars in the U.S., leaving only six million tons to cover the world's growing food needs.

Already commodity prices are rising. Sugar prices have doubled over the past 18 months (driven in part by Brazil's use of sugar cane for fuel), and world corn and wheat prices are up one-fourth so far this year.

For the world's poorest people, many of whom spend half or more of their income on food, rising grain prices can quickly become life threatening.

Once stimulated solely by government subsidies, biofuel production is now being driven largely by the runaway price of oil. Many food commodities, including corn, wheat, rice, soybeans and sugar cane, can be converted into fuel; thus the food and energy economies are beginning to merge.

The market is setting the price for farm commodities at their oil-equivalent value. As the price of oil climbs, so will the price of food.

In some U.S. Cornbelt states, ethanol distilleries are taking over the corn supply. In Iowa, 25 ethanol plants are operating, four are under construction, and

another 26 are planned.

Iowa State University economist Bob Wisner observes that if all those plants are built, distilleries would use the entire Iowa corn harvest. In South Dakota, ethanol distilleries are already claiming over half that state's crop.

The key to lessening demand for grain is to commercialize ethanol production from cellulosic materials such as switchgrass or poplar trees, a prospect that is at least five years away.

Malaysia, the leading exporter of palm oil, is emerging as the biofuel leader in Asia. But after approving 32 biodiesel refineries within the past 15 months, it recently suspended further licensing while it assesses the adequacy of its palm oil supplies. Fast-rising global demand for palm oil for both food and biodiesel purposes, coupled with rising domestic needs, has the government concerned that there will not be enough to go around.

Less costly alternatives

There are truly guilt-free alternatives to using food-based fuels. The equivalent of the three percent of U.S. automotive fuel supplies coming from ethanol could be achieved several times over -- and at a fraction of the cost -- by raising auto fuel-efficiency standards by 20 percent. (Unfortunately Detroit has resisted this, preferring to produce flex-fuel vehicles that will burn either gasoline or ethanol.)

Or what if we shifted to gas-electric hybrid plug-in cars over the next decade, powering short-distance driving, such as the daily commute or grocery shopping, with electricity?

By investing not in hundreds of wind farms, as we now are, but rather in thousands of them to feed cheap electricity into the grid, the U.S. could have cars running primarily on wind energy, and at the gasoline equivalent of less than \$1 a gallon.

Clearly, solutions exist. The world desperately needs a strategy to deal with the emerging food-fuel battle. As the world's leading grain producer and exporter, as well as its largest producer of ethanol, the U.S. is in the driver's seat.

Prof. Ajay Chandak's views on the above:

1. Farmers do not get right price for their produce and this resulted in many suicides in Maharashtra and Andhra Pradesh. If we consider the people who have purchase capacity for the food grains then the food grain production in the world is still in surplus. Hence food grain prices are not driven by laws of economics (demand and supply), rather the prices are decided by govt. policies and subsidies and other political factors, than economical factors. If part of the land use all over the world is shifted to energy (in any form for ethanol, biodiesel, firewood etc.) then the food

grain production will also be governed by demand and supply issues and farmers will be able to get much better price. This is what is exactly happening with oil now. Earlier oil production was more than the demand and oil companies/OPEC countries were deciding the cost. Now it is purely on demand supply issues.

2. Electrically driven vehicles: more emphasis on electricity generation and development of railway network is the key for India, rather than spending huge amounts on 6 lane/8 lane highways. With more than 80% oil imports, we are not going to be benefitted with oil based transportation systems.
3. There is another humanitarian angle to the issue. If more land use is shifted to energy production, then the losers will be the poorest African countries, who are surviving on charity of US and European countries. Developed countries are putting charity funds for the poor nations like Ethiopia, but I fear if the food grain prices go up and people in developed countries start struggling with filling their fuel tanks then they may reduce the charity budgets.
4. Green fuel (from agro based fuels) is not bright either. You need to occupy huge land for filling one car tank. ENERGY CONSERVATION and shifting to direct renewable energy sources will be the key.
5. My perception is India will be benefitted by switching over part of land use to energy technologies (only viable ones, not the stupid technologies like Jatropha for biodiesel etc.). Higher fuel costs will make inhouse production profitable and reduce import burden, and on the other hand reducing food grain production and also switching some oil seed production on biodiesel use, the cost of farm produce for food consumption will go up and farmers will start getting fare price.

Do we need Managers or Leaders?

True Leadership is the Use of Influence in the Absence of Authority.

Tomorrow's Child

Without a name, an unseen face,
And knowing not the time or place,

Tomorrow's child, though yet unborn,
I saw you first last Tuesday morn.

A wise friend introduced us two,
And through his shining point of view

I saw a day, which you would see,
A day for you, and not for me.

Knowing you has changed my thinking,
Never having had an inkling

That perhaps the things I do
Might someday threaten you.

Tomorrow's Child, my daughter-son,
I am afraid I've just begun

To think of you and your good,
Thought always having known I should.

Begin I will to weigh the cost
Of what I squander, what is lost,

If ever I forget that you
Will someday come to live here too.

By Glenn Thomas,
From Mid-course correction:
Toward a Sustainable Enterprise

Letters to the editor

"In the wonderland of energy managers"

THIS IS with reference to the recently concluded workshop held on demand side load management at MACT Bhopal, the proceedings of which were reported by your newspaper.

It was way back in 1981 that an Inter-Ministerial Working Group (IMWG) set up by the Govt. of India under the chairmanship of DV Kapoor had estimated energy saving potential of 20% in transport, 25% in industry and 30% in agricultural sectors. However, even after lapse of more than a decade we are still discussing the same issues which everybody who matters is already aware. Every now and then such workshops/seminars/conference are organised at the cost of public funds where experts and officials incharge of policy making discuss the same issues again and again. In a nut shell the whole concept of efficient utilization of energy resources has been reduced to a mere academic and ritualistic exercises. For example every year on 14th Dec. all the agencies like PCRA, Oil companies, Electricity Boards, state level energy development agencies, Energy management centre etc., compete among

themselves to conduct awareness programmes which are only ritualistic in nature and are hardly expected to produce any results.

As an engineer closely associate with many Govt. programmes for conservation of energy how I wish that another person like Sharu Rangnekar (the author of "In the wonder land of Indian Managers") would come forward to write specifically about the 'Wonders' being performed by the Indian Energy Managers some of the wonders being performed by them are given below to start with:

1. Oil company officials never get tired to teach housewives and college girls how to save LPG in kitchen but they have no time to prevent illegal use of domestic LPG cylinders by Hoteliers and car owners.
2. Another wonder performed by oil companies is to allow use of high speed diesel for generation of hot water in hotels/industries.
3. Electricity board officials perform 'wonders' by not giving the importance to T&D losses which mean more as 'Theft and Distribution' losses rather than 'Transmission and distribution' losses.
4. Another regular wonders of Electricity boards is to allow LT connection at places where, as per rules should be HT connection. Similarly allowing commercial users the ben-

efits of domestic consumers.

5. Energy Management Centre has performed many wonders including converting energy bus to a maruti van for easy "maneuverability".

6. Ministry of power keeps announcing addition of new power plants while on the other hand investment on energy conservation measures is not given its due importance, the increased power generation will indirectly help in easy availability of power to the industries then how the energy conservation measures will get boost is in itself a wonder.

There are many wonders being performed by the Indian Energy Managers, I would request the readers of your esteemed daily to come out with details of such wonders so that we could enrich our knowledge in the field of energy management.

SK Sood

'National Mail', Bhopal
Dated 10th Oct. 1994

Wonder on wonder

FURTHER to the "wonders" described by SK Sood in his letter (NM Dtd 10.10.1994) I would like to add the following "wonders" in the list:-

1. Many SSI units in MP perform "wonders" of getting electricity bill much less or negligible in comparison to the estimated consumption by electrical motors and other electrical appliances used by them.
2. In medium and large scale industries, the management will be busy in negotiating with the unions to avoid increase in salary of the workers while simultaneously lakhs of worth of energy will be wasted without anybody bothering for it.
3. The government has made it compulsory to include a statement in Annual Reports on the energy conservation methods being adopted by the industrial units. How-

ever, every year they come out with new excuses for not having implemented any energy saving measures. One really wonders what is the purpose of including such statements if no body is going to check the authenticity of them.

(AASHISH SHARMA)
BHOPAL

In the wonder land of energy managers

THIS is in reference to the letter of SK Sood published in your newspaper Dtd 10.10.94 under above caption. The points raised by him are very pertinent and are only tip of the iceberg. The very fact that the Govt has decided to give more emphasis to generate more and more power to meet the growing demand rather than adopting conservation

methods has revealed the failure of persons incharge of demand side management. Now the question remains to be decided is whether the concept of energy conservation is wrong or whether something is wrong with the people incharge of implementation of conservation schemes. It is high time that a white paper is published on the status of energy efficiency improvement programme launched by the Government in 1992.

Thanking you, I remain,

Manoj Mathew

'National Mail', Bhopal
Dated 17th Oct. 1994

In the wonderland, again

KINDLY refer to the letter to the editor "In the wonderland of energy managers" published in your paper dated 10th October, 1994. We wish to clarify the various points raised in this letter as follows:-

1) It is stated that most of the programmes concerning energy management are on awareness creation. This is so because the number of people and the devices used by them are very large in number and the maximum conservation could be achieved through change in attitude of these users. It is admitted that achievement of energy conservation depends on change in attitude of these users and to a great extent also on technology and other factors. Accordingly, the management has been on awareness creation and educating the users through mass media awareness campaigns, training programmes and demonstrations.

2) As regards illegal use of domestic LPG cylinders by hoteliers and car owners, use of high speed diesel for generation of hot water in hotels, industries, theft of electricity and LT connection at places where it should be for HT connection, cannot be controlled fully because of the large number of users. Further, these are part of the existing Indian

work culture and needs to be addressed at a different platform.

3) EMC used to Maruti Van as energy bus for propagating not only the initial cost but also the operating cost on long term basis. This was also a measure towards efficient facilities. However, if indeed this van by agencies is brought to our notice, we will take suitable action.

4) Regarding increased power generation making easy availability of power to the industries this will not come in the way of energy conservation measures as there is a large gap between demand and availability of energy. Further, the cost of energy is going up and this itself will promote energy conservation in industries.

It may be pointed out that energy conservation is being undertaken seriously and what is pointed out by the author about academic and ritualistic exercising is not true. Also, there is no question of organisations competing to conduct awareness programmes in a large country such as India, we need many organisations to carry out this important work.

RC Mahajan
Energy Economist

Thank you

I AM indeed thankful to RC Mahajan, Energy Economist (NM 31-10-94) for having responded to my letter published on 10-10-94. The very fact that he has covered all the points raised by me prove the messy state of affairs existing in relation to energy management in India. I really wonder who he has taken pains to reply on behalf of OIL companies, PCRA, Electricity Board, and other nodal agencies while none of the officials from these agencies have bothered to contradict the points raised by me. Does it show their guilt conscious? Or whether they want to convey that a person like me who has worked for 13 years with MFOON, the biggest consultancy organisation in the country and was involved in conducting more than 100 energy audits is writing nonsense? Whether I am right or wrong can be proved only if a public interest litigation is filed in the appropriate court to highlight the wastage of energy resources in India. I intend to do so, if there anybody to help me!

SK Sood

Energy auditing

Sir, — This has the reference to the report on the seminar on "Energy conservation schemes of the Industrial Bank of India" (DH — Nov. 25).

In addition to what has been reported, FKCCI President C. Valliappa had also suggested making energy audit compulsory in line with accounts auditing. It is unfortunate that much note was not taken of this suggestion.

In the broader perspective, it is high time that the Government introduces mandatory auditing of not only energy but what is called technical auditing of new and existing projects. However, before any such step is taken, institutions like the ICWA (Institute of Cost and Works Accountants) have to be enabled to prepare engineers to work as technical auditors.

As a first step the Government should permit certain reputed engineering consultancy firms to carry out technical auditing. Compulsory technical auditing will not only help conserve energy and material resources but also increase employment opportunities.

Sunil Kumar Sood,

Bangalore.

"Deccan Herald", Bangalore
in Nov. 1989

'Hang your geysers' to save electricity

HT Correspondent
Bhopal, December 14

THREE BHOPAL-based NGOs and an environmental consultancy group have jointly launched a 'save energy campaign' to draw the people's attention towards the basic causes of power shortage.

The campaign 'Hang your geysers' was launched on the occasion of the National Energy Conservation Day celebrated all over the country today. The groups also held open demonstrations of solar water heaters.

According to a spokesperson of the Enviro Consultants and Engineers,

the environmental consultancy organisation, a major contributor towards the high consumption of power during winters was the use of geysers, accounting for as much as 40 per cent of the total energy bill.

The NGOs SEEP, EEDS and VOICE have argued that this could be saved by installing solar water heaters in place of geysers. Though high installation cost is prohibitive, loans like the ones for housing construction could go a long way in financing them. The monthly installments of the loan would work out to be less than the savings in electricity bills, the groups reckon.

The use of geysers also contributes to the peak load significantly, making a fair share of contribution in forcing the Madhya Pradesh State Electricity Board (MPSEB) to announce power cuts.

Citing a recent report, there are 30 million geysers in the country with an average load of 2 kw per geyser. It has been estimated that about six per cent of the total electricity consumption is due to geysers for heating water. Considering the total consumption of 499 billion kwh electricity in 2000-01, the consumption due to geysers works out to more than Rs. 12,000 crore annually.

'Hindustan Times', Bhopal
dated 15 Dec. 2002

Food for fuel?



Biofuels may seem like the panacea of an energy-hungry world. But are we counting chickens before the eggs have hatched, wonders Jayalakshmi K.

It could be the first CDM (clean development mechanism) project in the transport sector of the country and could earn up to 0.115 million dollars every year, just to begin with. When its scope is extended it would mean earning 1.9 million dollars every year. That is the BMTC project to run 280 of its buses on biofuel.

More important than the money, this could mean avoiding for the period between 2006 to 2013 a total emis-

sion of 2788.9 tonnes of carbon dioxide equivalent. When extended to the entire fleet it would mean a reduction of 489 tonnes of emissions every day!

A few buses of both the KSRTC and BMTC have been run on pilot projects using biofuel. It was shown to increase efficiency and reduce exhaust emissions. No engine retrofit was found to be required. The plan was to expand the number by end of March this year.

However, it has not yet taken off

simply because of the unavailability of the fuel. "Tenders have been put out and we are waiting," said Anand Rao, environmental adviser, KSRTC, who is also handling the section at BMTC.

According to him, the prices have gone up from Rs 28 to 33 per litre, and most of the biofuel seeds is being sold to the neighbouring states for higher prices.

The project would require 1226.4 kilolitres of biofuel whereas the State

GREENS SOUND RED ALERT



... time running out for our planet

Bangkok: International delegates on Friday agreed that the world has the technology and money to limit catastrophic global warming, but that it must act now to reduce the harmful effects of greenhouse gas emissions.

China, the world's second-largest greenhouse gas emitter after the United States, took a strong stance. Along with India and other developing countries, it had pushed to raise the lowest target for carbon dioxide in the atmosphere.

GREEN REPORT

- Promptly adopt biofuels, renewable energy sources, greater energy efficiency and other steps.
- China's efforts fail to remove mention of a stringent emission target from report.
- World must act immediately to cap the global temperature increase at 2 degrees Celsius over preindustrial-age levels.

► See P11

Women make their way on a Ho Chi Minh highway in this April 2005 file photo in Vietnam. Delegates at Global Climate Change conference in Bangkok said on Friday the world has money to limit global warming, but it must act now to reduce harmful effects of greenhouse gases. — AP

"Deccan Herald", Bangalore

"Indian Express", Bangalore

PM gets cracking on climate

DH News Service

NEW DELHI: Faced with global pressure to take action on the climate change front, Prime Minister Manmohan Singh has asked his council on climate change to prepare a national programme charting the future course.

"We should come out with a national programme document by November, 2007 capturing both the efforts that we have made so far and our plans for the future. As a prelude to this we must prepare a national report on the impact of climate change," the prime minister said, inaugurating the first meeting of the council.

A three-member sub-committee, comprising Principal Scientific Advisor to the Prime Minister R Chidambaram, chairman of the UN Inter-Governmental panel on climate change Dr R K Pachauri and former Union environment secretary Pradip Ghosh, will submit the report by November. The

India has six million hectares of cultivable degraded forest land. The government plans to undertake a major programme making it one of the world's largest afforestation efforts in recent times.

MANMOHAN SINGH
Prime Minister

council will act as a think tank to decide on India's future course of action after 2012 when the Kyoto Protocol expires.

No legal mandate

India has made it clear that it will not accept any legal mandate on green house gas emission reduction as it will impact the GDP growth.

"This will mean a sharp cut on the industrialisation and modernisation drives as the number of factories, industrial parks, trading hubs and automobiles has to be brought down. It will virtually kill the booming economy, which is growing annu-

ally by more than eight per cent," said an environment ministry official.

To increase the forest cover, the government plans to launch a national campaign on August 15. This will boost the target of achieving the national goal of having 33 per cent tree and forest cover by 2012.

Only 20.64 per cent of the country is under forest cover at the moment. But the government has actually digressed from its original plan of having 33 per cent 'forest cover' to have the same area under 'tree and forest' cover. The Union Environment Ministry is

now planning to allow the private sector enter the forestry sector.

"India has six million hectares of cultivable degraded forest land. The government plans to undertake a major programme to make it one of the world's largest afforestation efforts in recent times," Dr Singh said.

Highlighting the importance of energy efficiency, PM said the Bureau of Energy Efficiency had suggested a Bachat Lamp Yojana which would provide compact fluorescent lamps at the price of normal bulbs to domestic households.

The price difference would be recovered through the sale of carbon credits and carbon emissions of CFLs. This project can reduce emission of 240 million tonnes of carbon dioxide every year and lead to a reduction of 10,000 MW of electricity demand.

Both programmes are scheduled to be launched around August 15.

From red tape to green!

This book shows how the Ministry for Environment and Forests is favouring industrial growth over environmental concerns!

Perhaps it can be said that the EIA Notification (Environment Impact Assessment) is one of the best examples of the blatant disregard the government and its bureaucrats have towards public opinion, as also to anything that comes in the way of 'economic growth'.

That could have been pardoned but for the fact that this notification was issued by none other than the Ministry of Environment and Forests (MoEF)!

The ministry that is expected to safeguard the interests of the environment believes the notification is a 'subordinate legislation' and did not even think it necessary to be discussed before Parliament!

Considering that it deals with finding a mechanism to incorporate environmental safeguards by involving public opinion and identification of impact potential of development projects, the fact that public opinion and local government involvement was not sought, but instead all regard given to the concerns of industry as evidenced by the number of meeting and points raised on behalf of them, it becomes clear who the ministry is a spokesperson for!

Initiated by the MoEF under a World Bank project, with the recommendations of the Govindarajan committee on investment approvals in mind, the Notification looks like an industry agenda. Deemed clearances for pre-con-

struction activities, land acquisition before environmental assessment and extension of environmental clearances to mining and dam projects make the MoEF motives highly suspect.

Many of the high impact industries initially placed under the ambit of the Notification have since been exempted, especially the automobile and construction sector. Regulation of SEZs, construction sector have also been weakened.

Industry on top

Rightly as the Environment Support

Group notes, at a time when the country is set to accelerate its growth, the EIA would have been the right tool to keep a balance between ecological security and development. But it looks like the investment priorities have over-riden all other priorities.

It is in this context that ESG has brought out its review of the notification in a book titled Green Tapism.

In a cautionary approach the book begins with some shocking news on proposed bills like the Environment Clearance Bill (a self-certification bill for indus-



Green Tapism

Leo F Saldanha, Abhayraj Naik, Arpita Joshi, Subramanya Sastry, 2007, pp 185.

tries!!) and the National Commission for Exploitation of Natural Resources Bill, both of which subordinate environmental protection to the greater cause of the 8 per cent growth!

It examines in detail why the Notification is a worsened modification of its earlier form. On the presumed decentralisation which ESG contests that it is not, the excessive centralisation of decision making, the loopholes that

make expert site visits dubious, lack of screening safeguards, ambiguous language in defining pre-feasibility report, no public participation in scoping, the various problems in enforcing environment clearances, have all been dealt with convincingly and with case studies. The annexures also come in very useful.

The team at ESG has to be commended for bringing to light the irregularities in the present Notification and making a case for why it must be repealed.

JAYALAKSHMI K

"Deccan Herald", Bangalore

Tax cut for rain-harvesting and solar heating systems

DH News Service

BANGALORE: All properties to be developed on 60x60 sites will henceforth have to compulsorily go for rain water harvesting (RWH) and five and two per cent rebate on property tax will be given for residential and commercial buildings (with RWH facility) respectively for the first five years.

To avail oneself of the rebate offer, one must incorporate the RWH system in the building plan itself.

Similarly, the Master Plan recommends solar lighting and solar water

heating for all new development/constructions.

If solar lighting and solar water heating is adopted, then refundable security deposit shall be returned along with two per cent interest.

Available from 2nd

Copies of the Master Plan 2015 will be sold at the BDA main office from Monday.

BDA has fixed the rate of each copy at Rs 5,000. The Authority will also upload the plan on its website - www.bdaBangalore.org

ZONING NORMS HIGHLIGHTS

- Floor area ratio (FAR) up to 4.0 around metro stations
- FAR up to 4.0 around bus terminals of BMTC
- Additional FAR for old areas
- Compulsory tree planting on 2400-sq-ft and 4000-sq-ft sites
- Rain water harvesting compulsory beyond 2400 sq ft
- 5 and 2% cut on property tax for residential/commercial units for RWH
- Provision of commercial uses up to 3 per cent of permissible residential area (55 per cent), when extent is over 10 hectare
- Area measuring 3X5 mt to be reserved for installing electrical transformer for buildings more than 500 sq mt

"Deccan Herald", Bangalore

"Deccan Herald", Bangalore

After much heat, roadmap drawn to tackle global warming

Just 8 years to save the planet

BANGALORE, Dec. 12 (Herald) — A roadmap to tackle global warming was unveiled on Wednesday by the Government of Karnataka. The roadmap, titled 'Karnataka Climate Change Policy 2015', was presented by the Minister for Environment, Forests and Wildlife, Dr. H. D. Deve Gowda. The policy aims to reduce the state's carbon footprint by 20% by 2020 and 50% by 2050. It also sets targets for renewable energy, energy efficiency, and climate-resilient infrastructure. The policy is a landmark document as it is the first of its kind in India. It outlines a comprehensive strategy to address climate change, including measures to reduce greenhouse gas emissions, enhance carbon sinks, and build resilience to climate change impacts. The policy also emphasizes the importance of public participation and transparency in the implementation of the roadmap. It sets up a Climate Change Committee to monitor the progress and report to the government. The roadmap is a clear signal that Karnataka is committed to tackling global warming and achieving sustainable development.



and Bangalore. The 100-page report, titled 'Karnataka Climate Change Policy 2015', was presented by the Minister for Environment, Forests and Wildlife, Dr. H. D. Deve Gowda. The policy aims to reduce the state's carbon footprint by 20% by 2020 and 50% by 2050. It also sets targets for renewable energy, energy efficiency, and climate-resilient infrastructure. The policy is a landmark document as it is the first of its kind in India. It outlines a comprehensive strategy to address climate change, including measures to reduce greenhouse gas emissions, enhance carbon sinks, and build resilience to climate change impacts. The policy also emphasizes the importance of public participation and transparency in the implementation of the roadmap. It sets up a Climate Change Committee to monitor the progress and report to the government. The roadmap is a clear signal that Karnataka is committed to tackling global warming and achieving sustainable development.

The report also stated that the state has a target of 10% renewable energy in its total energy mix by 2020. It also aims to achieve 50% energy efficiency in its buildings and 20% in its industries by 2020. The report also mentions that the state has a target of 10% renewable energy in its total energy mix by 2020. It also aims to achieve 50% energy efficiency in its buildings and 20% in its industries by 2020.

"Deccan Herald", Bangalore



Solar energy unit at the 'Energy Park', inaugurated at the Mahatma Gandhi Centre of Rural Energy and Development at Jakkur, in Bangalore on Wednesday.

KSRTC to enter carbon trading

DH NEWS SERVICE

BANGALORE: The KSRTC will begin carbon trading activity within six months under the World Bank's Certified Emission Reduction Scheme, KSRTC Managing Director A P Joshi said.

Speaking to media persons after inaugurating a bio-diesel plant set up at the Mahatma Gandhi Centre of Rural Energy and Development on Wednesday, Mr Joshi said the KSRTC will be able to reduce about 44,000 tonnes of carbon dioxide per annum following the usage of bio-diesel and ethanol.

By carbon trading under the World Bank's Clean

Development Mechanism, the KSRTC can earn eight to ten dollars per tonne and it the first transport corporation in the country to get the benefit, he stated.

"The KSRTC is using bio-diesel in 76 buses and proposes to go for large scale usage in the coming days. It has drawn up plans to use the bio-diesel in 2000 buses. Moreover, 7.7 per cent ethanol mixed diesel is being used in 110 buses. The results in both cases are highly encouraging", he explained.

Inaugurated

Earlier, inaugurating the bio-diesel plant and also an energy park in the Centre premises,

"Deccan Herald", Bangalore

Countries with large population without access to electricity			
Country	Population without access to electricity (mln)	% age of total	Per capita consumption (kWh)
India	579.10	35.44	393
Bangladesh	104.40	6.39	102
Indonesia	98.00	6.00	390
Nigeria	76.15	4.66	85
Pakistan	65.00	3.98	374
Ethiopia	61.28	3.75	24
Myanmar	45.30	2.77	74
Tanzania	30.16	1.85	55
Kenya	27.71	1.70	107
Nepal	19.50	1.19	61
DPR Korea	17.80	1.09	1288
Mozambique	16.42	1.00	47
World total	1634.20	100.00	2343

Source: IEA 2002

Now, a small box to convert car fumes into biofuel

Quasquare: The world's richest corporations spend billions trying to solve the problem of carbon emissions, but three fishing buddies in Wales, UK, believe they have cracked it. They have developed a box which can be fixed underneath a car in place of the exhaust to trap the greenhouse gases such as carbon dioxide and nitrous oxide — which are blamed for global warming — and emit mostly water vapour.

The captured gases can be processed to create a biofuel using genetically modified algae. Dubbed "Greenbox," the technology — developed by organic chemist Derek Palmer and engineers Ian Houston and John Jones — could be used for cars, buses and eventually buildings and industries, including power plants. The only emissions they are not sure the box can handle are those from aviation.

"We've managed to develop a way to successfully capture a majority of the emissions from the dirtiest motor we could find," said Palmer, who has consulted for organisations including the World Health



Organisation and GlaxoSmithKline. The three, who stumbled upon the idea while experimenting with carbon dioxide to boost algae growth for fish farming, have set up a company called Maes Arturion Limited, which is Welsh for 'Field Adventure'.

Although the box the men currently use for demonstration is about the size of a bar stool, they say they can build one small enough to replace a car exhaust that will last for a full tank of petrol.

The crucial aspect of the technology is that the carbon dioxide is captured and held in a secure state, said Houston.

Other carbon capture technologies are much more cumbersome or energy-intensive, for example using miles of pipeline to pipeline to transport the gas.

"The carbon dioxide, held in its safe, inert state, can be handled, transported and released into a controlled environment with ease and a minimal amount of energy required," Houston said.

More than 130 tests carried out over two

years at several testing centres have yielded a capture rate between 85 and 95 per cent. The men are also in contact with leading car-makers across the world.

If the system takes off, drivers with a Greenbox would replace it when they fill up their cars and it would go to a bioreactor to be emptied.

Through a chemical reaction, the captured gases from the box would be fed to algae, which would then be crushed to produce a bio-oil. This extract can be converted to produce a bio-diesel almost identical to normal diesel.

This bio-diesel can be fed back into a diesel engine, and the emptied Greenbox can be affixed to the car, restarting the cycle.

The process also yields methane gas and fertiliser, both of which can be captured separately.

The algae required is minimal, and the three investors estimate that around 10 facilities could handle the carbon dioxide from nearly 30 million cars.

REUTERS

Machado et al. 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 2680, 2681, 2682, 2683, 2684, 268

Indian Association of Energy Management Professionals

MISSION OF IAEMP

To make our country “Energy Independent” by the year 2022, the year when we will be celebrating Platinum Jubilee of our political independence. The mission is called “Mission-2022”

OBJECTIVES OF IAEMP

1. To promote quality in the profession of Energy Professional through education and training. Also to facilitate introduction of best practices and to disseminate Energy in formations amongst its members to upgrade their skill and knowledge
2. To conduct preparatory courses for professionals examinations relating to the profession of Energy.
3. To promote research and studies in Energy Control and minimization techniques and measures and share the same with the concerned stake holders and to update its members on application of new technologies for improving service to the users and consumers.
4. To bring out guidance notes, instruction manuals, periodicals for the use and benefit of members and others connected with the profession of Energy Professionals.
5. To develop and administer the code of conduct and ethics from time to time and ensure compliance of the same by its members and also ensure that the members maintain / adhere to high standards of integrity, transparency, discipline and professional conduct.
6. To ensure speedy implementation of “The Energy Conservation Act, 2001” in letter & spirit.
7. To work for unification of all agencies working in the fields of energy efficiency & renewable energy under a separate ministry to be called “Ministry of Energy Efficiency & Renewable Energy” (MEERE).

8. To Function as an association of professionals i.e. To take care of the legitimate interests of the Energy Professionals including Energy Auditors, Energy Managers & practitioners keeping in view the overall national perspective.
9. To interact with BEE and state level designated agencies for interpretation and speedy implementation of the various provisions of the Act such as:
 - Dissemination of information (clause – e, section 13)
 - Conducting Training Programmes (clause – f, section 13)
 - Strengthening of Consultancy Services (clause –g, section 13)
 - Promoting R & D (clause – h, section 13)
 - Providing feed back and follow-up services (clauses-d,k and n, section 14)
10. To arrange training programmes for EAs/EMs & Energy practitioners and enhance their capabilities.
11. To maintain instrument bank and library facilities.
12. To generate employment business & Professional opportunities.
13. To promote Energy Efficiency / Conservation Awareness by conducting seminars, Workshops, Exhibition.
14. To Associate with like minded association (s).
15. To increase Membership.
16. To synchronize the expertise of professionals.

History of Formation

1. Call for formation of an all India level association was given by S.K. Sood on Republic day 26.01.06 by sending 400 e-mails to all Energy Management Professionals.
2. The association was formed on 26.02.2006 with considerable initial effort from S.K. Sood, R.A. Sharma, B. Satyanarayana, Prof. K.R. Ramana, S. Khandekar, A.K. Saboo, A.R. Venkataraman.
3. Mr. R.A. Sharma provided complete office and infrastructure facilities from his premises.
4. The initial meeting at Hyderabad attended by 16 persons from all over India.
5. Bylaws were finalized with active involvement of Mr. A. R. Venkataraman.
6. The Association was registered as All India society with registration No.1185/2006 dt 29.08.2006 with active follow up by Mr. K. V. S. Reddy.
7. Website of IAEMP <http://iaempenergy.googlepages.com> It was created by Mr. B. Satyanarayana in June 2006.
8. Exclusive yahoo group, iaemp@yahoogroups.com started in September 2006 for sharing of ideas on daily basis. The Group is moderated by Mr. S.K. Sood.
9. Elections held in January 2007 and new Central Council and Office Bearers took oath on 1st March 2007.

Activities Carried Out

1. Mr. G.G. Dalal prepared a representation regarding immediate actions required to be taken on implementation of EC Act. The representation was signed by members individually and sent to honorable President of India.
2. Mr. R.A. Sharma, President, IAEMP supported by Prof. K.R. Ramana, A.R. Venkataraman, K.V.S. Reddy, P.N.Rao organised a grand national seminar on Energy efficiency and EC Act at Hyderabad.
3. Director General BEE met the office bearers of IAEMP Mr. G.G. Dalal, VP, Mr S.K. Sood, GS and Mr Vikas Apte, and Ms. Pratiksha Porwal at Mumbai on 28th Sept.06. Subsequently, a detailed letter was sent by Mr SK Sood raising points of concerns of all EA/EMs and also issues related to implementation of the EC Act, 2001. IAEMP received a reply to the letter from BEE.
4. IAEMP prepared Status of Implementation of the EC Act, 2001, which was discussed with the Bureau of Energy efficiency (BEE) and clarifications obtained

on many issues.

5. IAEMP took up with BEE the problems being faced by the candidates of

IAEMP Office Bearers

S. K. Sood, President, MECON, Bangalore

e-mail: sunilsolar@yahoo.co.in, Mobile: 099019-11910

G. G. Dalal, Vice President, Energy Consultant, Mumbai,

e-mail : ggdalal@mtnl.net.in, Mobile: 098920-71444

Vikas Apte, Secretary, Energy Consultant, Mumbai

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B. Satyanarayana, Treasurer, BHEL, Hyderabad,

e-mail: bhisatya@bhelhyd.co.in, Mobile: 098488-10120

R.V. Ramana Rao, Dy. Secretary, Energy Consultant, Vizag

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Bhupal Singh, Jt. Secretary, Energy Consultant, Gaziabad

e-mail: singh.bhupal@gmail.com, Mobile: 098185-27944.

S. P. Nanda, Jt. Secretary, NALCO, Damanjodi

e-mail: nandasap_dmj@yahoo.co.in, Mobile: 094370-55650

Central Council members

Central Zone: Dr. Alok Saboo, G.S. Chopra, Abhaya Swarup, Northern Zone: S.K. Gupta, M.P. Sinha, R. Vaidyanathan, Nitin Sharma Eastern Zone : Sunil Biswal, G.H. Iyer Western Zone: P.K. Barad Southern Zone: R.A. Sharma, Immediate past president, S.R. Varma, Prof. K.R. Ramana

State Co-ordinators

Andhra Pradesh	:	Mr. A. R. Venkatraman
Madhya Pradesh	:	Mr. K. D. Bairagi, Bhopal
Karnataka	:	Mr. Prakash Magal, Bangalore
Maharashtra	:	Mr. S. Khandekar, Nagpur
Uttar Pradesh	:	Mr. Nitin Sharma, Mathura
Chattisgarh	:	Mr. P. S. Raghuvanshi, Raipur
Delhi	:	Mr. Vaidyanathan, New Delhi
Gujarat	:	Mr. P. K. Barad, Vadodara

Other active members

Prof. Ajay Chandak, S. Khandekar, M. Krishna Murty, T. Srinivas,

Ms. Pratiksha Porwal, R. S. Hiremath, Dr. IPS Paul, R. Kamdin, K. Rahul Sharma

Chapter 1

Managing energy

IAEMP wishes to acknowledge that its slogan, **'Conscience keepers to the nation on energy matters'** has been adopted from the words of **Dr. N. S. Wooding**, as quoted by Gordon A. Payne in his book titled 'Managing Energy in Commerce and Industry' published by Butterworths.

1.1 The role of the energy manager

The most important ingredients in the effective management of energy are a genuine commitment at the top and a capability within the organisation to take action rather than to talk about it. Without these, most other effort will be wasted or, at best, seriously frustrated.

Commitment, once it has been clearly proclaimed, should be demonstrated by the appointment or nomination of someone of sufficient calibre to be responsible not only for reducing the organisation's energy costs but also assuming a wider role, aptly described by Dr N. S. Wooding of Courtaulds', as 'keeper of the company's conscience on all matters affecting energy'.

Media coverage about "Mission 2022"

ELECTRICITY / One unit saved is three units generated

Beware ghosts that gobble up power at homes

By JAYALAKSHMI K
DRI News Service

BANGALORE: Are you aware of those consumers that set up more than half the power to their homes? Do you know that this can easily be checked? Not only in homes, but in large organisations.

Given that there is around 25,000 view of the world, just imagine what power can be saved if this 'when saved' would amount to, when everyone is looking at power saved in general power with their hand, a group of engineers is trying to make their contribution to the immense potential for conservation energy by reducing waste.

This small group of dedicated professionals met in the City on Saturday to set a big goal for the nation. The goal is to reduce the 'leakage' of power to homes. And to 'dependance' by 2022. And to 'dependance' by 2022. And to 'dependance' by 2022. And to 'dependance' by 2022.

Registered under the 2001 Indian charter of the Indian Association of Energy Managers, the group has members from all over the country. They are all professionals, energy auditors, who have been in the field for more than 10 years. They are all professionals, energy auditors, who have been in the field for more than 10 years.

IAEMP Thanks "Deccan Herald" & the Reporter Ms. K. Jayalakshmi for the coverage which helped us generate mass awareness about the need for public participation to realise dream of Energy Independent India

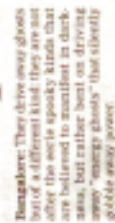
This is not about energy that do the job. Above all, we wish to reduce the public on the these consumers of power. We are not about to reduce the power in their homes. We are not about to reduce the power in their homes. We are not about to reduce the power in their homes.

Chelvi, new secretary of the Karnataka chapter of IAEMP, said, "These include 'try not to be present of the chapter'."

"The chapter will go a long way in taking the issue to the grassroots, believes N. Sood. In a recent implementation of the energy conservation act and in using the many lines concerning 'energy' under the umbrella act, we are in a position to take the issue to the grassroots."

Anyone who is an expert with a minimum of three years experience can join as member of the IAEMP. But above all, as the chairman, to the local, which is that of energy conservation. Call 990191310.

Keep watch on the energy ghost



"Currently we are focused on making people aware of the 'ghosts' that gobble up power at home, without their knowledge," he said.

"Fans working on the electromagnetic regulator consumes just 40 watts. While a stay regular consumes just 30 watts for the fan running on the same speed," he said.

At the organisational level, it is employees leaving their computers on for hours together even when they were busy doing other work that did not require the computer. Switching off the monitors could

The Association has now come up with several energy saving ideas and have volunteered to conduct energy audits for individual households, companies or organisations to make them aware of these silent drains eating up power.

energy boosts the consumer could save on 30-43% of energy consumption, and upto 18 units per month," he said.

wasteful consumption of power. Such a check could even deter others from wasteful energy consumption.

These people could act as CEOs, but instead of auditing accounts, they can audit energy consumption. Seod said adding as per legislation.

Media coverage about "Mission 2022"



**KIRLOSKAR FERROUS INDUSTRIES LIMITED**

Enriching Lives

Ref: KFIL/EM/07

Date: 11-07-2007

To
The President
Indian Association of Energy Management Professionals
Regd.Off: 7, Tirumala Commercial Complex
Paradise Circle, Near Kamath Hotel
S.D.Road
SECUNDERABAD – 500003.

Dear Sir,

Sub: Membership Application for "Organisation Member".

We wish to inform that we have nominated our Sri.Raghavendra Joshi, Senior Manager (Electrical Dept.) for the above mentioned membership.

Kindly find attached duly filled-in application along with cheque (payable at par) bearing No.357112 dated 07-07-2007 for Rs.11,000/- drawn on ING Vysya Bank Limited, towards Admission Fee and Annual Fee.

Kindly acknowledge the receipt of the same.

Thanking you,

Yours faithfully,
for Kirloskar Ferrous Industries Limited

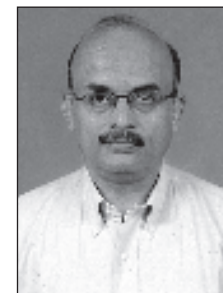
N.B.Ektare
Associate Vice President – PIP

Encl: (1) Application Form
(2) Cheque

IAEMP Thanks
M/S. Kirloskar Ferrous Industries Limited
to join as the first "Organisation Member"



Regd. Head Office: Lakshminagar Kirloskar Road, Pune - 411 003, Maharashtra (India) Phone: +91 (20) 25813341 Telex: +91 (20) 25813208 25813209
Works: Bellur Village, PO: Hiral - 583 234 Taluk: & Dist: Koppal, Karnataka (India) Phone: (08379) 298715 298753 Telex: (08329) 298706 298714

IAEMP Central Office Bearers

S. K. Sood
President, Bangalore



G. G. Dalal
Vice President, Mumbai



Vikas L. Apte,
Secretary, Mumbai



B. Satyanarayana
Treasurer, Hyderabad



R. V. Ramana Rao
Deputy Secretary, Vizag



Bhupal Singh,
Jt. Secretary, Gaziabad



S. P. Nanda
Jt. Secretary, Damanjodi

IAEMP Central Council Members



R. A. Sharma
Immediate Past President



Dr. Alok Saboo
Central Zone



Saurabh Jain
Central Zone



Abhaya Swarup
Central Zone



S. K. Gupta
Northern Zone



M. P. Sinha
Northern Zone



R. Vaidyanathan
Northern Zone



Nitin Sharma
Northern Zone



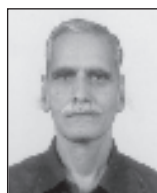
Sunil Biswal
Eastern Zone



G. H. Iyer
Eastern Zone



P. K. Barad
Western Zone



S. R. Varma
Southern Zone



Prof. K. R. Ramana
Southern Zone

Active IAEMP Members



Prof. Ajay Chandak



S. Khandekar



M. Krishna Murty



Anand G K



**Ms. Pratiksha
Porwal**



K. D. Bairagi



K. V. S. Reddy



Kalyan Kumar D.



Sunil U. Jadhav



Uma Maheshwaran



Johny P. A.



P. S. Raghuvanshi



Dr. Jayant Bapat



Rama Krishna .T



Rajmohan



Prakash Patil



Om Prakash



Rajesh Bisaria



Rajeev Sood



Vidya Sagar KVP



Balasubramanian P.



Rama Murthy S.



Rajshekhar



T. Srinivas
Secretary, Vizag Local Centre



Vijay Kumar Jain



Narare Balaji B



Prem Kumar



**Satynarayana
Burra**



Harsh Gupta



**Arwind Prasad
Mahadik**



**Manmeet
Singh Ahuja**



Pulla Reddy D.



Rahul Sharma



Sugandhi G



Raghvendra



B.R. Sathyakeerthi



Praveen H.

IAEMP Karnataka State Council



Dr. I.P.S. Paul
Chairman



Shreepati Shukla B.
Secretary



Rohinton Kamdin
Treasurer



Prakash Magal
State Coordinator



Arvind Thukral



Raghavendra Joshi



Satish Jadhav



R. S. Hiremath



I A E M P

INDIAN ASSOCIATION OF ENERGY MANAGEMENT PROFESSIONALS

Regd. Office: 7, Tirumala Commercial Complex, Paradise Circle,
Near Kamath Hotel, S.D. Road, Secunderabad - 500 003, A.P., Ph. 27810214, 27818831
Admn. Office : 417, 41st Cross, 5th Block, Jayanagar, Bangalore - 560 041. Ph: 080-2664 7813
Western Region Office : 201 A, Parkland 2, Raheja Estates, Kulupwadi Road, Borivali (E),
Mumbai - 400 066. Telefax: 022-28844526 Mobile: 919820336218
Web page : <http://iaempenergy.googlepages.com>

State / Local Centre Name			Please Paste Your Photograph Here
MEMBERSHIP APPLICATION FOR:			
(a) Student/ Associate Member/Corporate Member /Corporate Life Member/Organisation Member			
(b) Upgradation from _____ to _____			
Name	_____ (Surname) _____ (First Name) _____ (Middle Name)		
Father's Name			
Date of Birth			
PAN Card No.			
Business Address			
Telephone with STD Code			
Pin code:			
Fax			
Mobile Phone			
Email			
Home Address			
Telephone with STD Code			
Pin code:			
Fax			
BEE Certification status			
CEA/CEM/ Appeared result awaited/ will appear			
Area of Specialisation			
Preferred Mailing option			
Email/ Business Address/Home Address			

Educational Record: (Pl. attach separate sheet if required)

Course	Name of Institute/ University	Location (City/Town)	Period (From-To)

Employment Record: (Pl. attach separate sheet if required)

Period(From-To)	Name and Address of Employer	Designation	Specific Duties

REFERENCE (Preferably by IAEMP member)

I know the applicant by _____ (personal/business) association for approximately _____ years. To the best of my knowledge, the above information is correct and as such. I recommend the applicant to be elected to membership, Additional comments: _____

Reference Name /Address: _____

Membership Number: _____ Signature: _____ Date: _____

CERTIFICATE BY APPLICANT

I hereby certify that I have read the Objectives/ and Bye Laws of IAEMP as given in web page: <http://iaempenergy.googlepages.com>

I solemnly affirm and declare that the information furnished above is true and correct. I hereby undertake that if admitted as a member of the Association, I shall be bound by the Rules and Regulations and Bye-laws made there under and as amended from time to time and shall abide by such bye-laws, rules, standing orders, directions, conditions or guidelines as may be laid down by the Association and made applicable to me from time to time.

Witness my hand this.....day of.....year.....

Signature of the Applicant..... Place

FEE STRUCTURE

	Admission Fee	Annual Fee
1. Student Member (studying at university)	Rs 300	Rs 200
2. Associate Member (?15 years experience)	Rs 500	Rs 500
3. Corporate Member (>15 years experience)	Rs 1000	Rs 500
4. Corporate Life Member	(One time Rs 6000)	
5. Organization Member	Rs 10000	Rs 1000

Mode of Payment :

Demand Draft payable at Hyderabad or any where banking cheque of ICICI, HDFC , SBI etc. in favour of " Indian Association of Energy Management Professionals" .

Filled-in application along with cheque / DD may be sent to :

1. Shri PRAKASH MAGAL, 417, 41st Cross, 5th Block, Jayanagar, Bangalore - 560 041. Ph: 080-2664 7813
2. Shri V.LAXMAN APTE, 201 A, Parkland 2, Raheja Estate, Kulupwadi, Rd, Borivali(E),Mumbai-400066 Ph : 919820336218, 022-28844526

Payment Details

Cheque/Draft Number : _____ Amount : _____

Drawn on : _____ Date : _____ Signature & Date

For office use:

Admit <input type="checkbox"/>	Reject <input type="checkbox"/>	Membership grade:
		Membership No:
Remarks :		(Processed by) (Approved by)