ELECTRICAL INSTALLATION ENGINEER

NEWS LETTER

TAMILNADU ELECTRICAL INSTALLATION ENGINEERS' ASSOCIATION 'A' GRADE (Regn. No. 211/1992)
No.1/61-10, Plot no. 48, Ground Floor, 3rd Street, Ravi Colony, Near Kathipara, St. Thomas Mount, Chennai – 600 016.
Phone: 044-22330601, 9710204300 Email : tnagrade@gmail.com Website : www.teiea.com

ISSUE NO. 167 | VOL : No. 15/2020 | MONTHLY ISSUE NO. 1 | PRIVATE CIRCULATION ONLY | JANUARY 2020

EDITORIAL

Dear Members, Fellow Professionals and Friends

Seasons Greetings To One And All!

Greetings For A Happy And Prosperous 2020!!

Happy Pongal Greetings!!!

Happy Republic Day Greetings!!!!

This January marks the birth of New Year as well as a New Decade and it will certainly make an interesting analysis both with regard to our Country as well as our State. In terms of Economy and our efforts to march towards a 5 Trillion Dollar Economy, there are reports of slow down to some extent, which we hope is only temporary, as the efforts to strengthen and ensure growth in all three areas of Industries, MSME and Agriculture are in right direction and the nature is also helping in this regard with good monsoon in most of the parts of the country. Successful Green revolution and the White revolution of the earlier decades have helped us maintain our self-sufficiency and even surplus in many years. We know our potentials are huge with equitable distribution of waters all over the country and there are many efforts in this regard which can succeed with the cooperation of all states and the people. Global slowdown of economy has affected to some extent, but we are certain to achieve our premier position as one of the leading economies of the world.

Our relationships with most of the countries of the world appear good and our image as one of the largest democracies of the world has helped us to maintain and increase trust and relationships. In the process, we have not only consolidated the efforts to fight terrorism but have also improved our strength and safety along the borders.

Pongal is an important festival in Tamilnadu when we worship Agriculture and the cattle and the Sun God. The festival is celebrated all over the country in different like Makara Sankranthi, Kanumu, Lohri, Bihu and so on. Tradition, respect and adoption of technologies and methods have all helped Agriculture and Rural Development in a big way in the past and we can certainly hope to grow more and more. We also celebrate Tiruvalluvar during this time and we can feel aptly proud that his Tirukkural has come to be read more and more in many parts of India as well as the World.

Republic Day on the 26th of this month is an important celebration to mark our total commitment to Democracy and various other dimensions in tune with the dreams of the 'Father of our Nation" Mahathma Gandhi. It is important for all the citizens of India to remember the sacrifices made to get Freedom for the country and the collective and committed work put together to get our Constitution in place. The great work of leaders to put the country together and to work for progress under very difficult conditions and poverty at large are all important to be remembered as that foundation has only helped us to grow initially and the growth in the past 30/40 years has been phenominol. There are enough hopes that the coming decade will take us to great heights.

We thank all those members who have helped us by participating in the advertisement appearing for the issue December 2019 – Galaxy Earthing Electrodes Pvt. Ltd., Power Square Engineers (Indotech Transformers Ltd.), Ringlet, Supreme Power Equipment Pvt. Ltd., Value Engineers.

Editor

ELECTRICAL INSTALLATION ENGINEER

President : S.D. POONGUNDRAN
Secretary : P. SUYAMBU
Treasurer : M. BALAMURUGAN

Editor : S.K. PANDIAN
Advisor: S. MAHADEVAN
Printer : M. VENKATARAMAN

CONTENTS

KNOW THY POWER NETWORK - 148

5. Desalinetion plants. Is this a New Life line for Water Starved People or a costly/expensive environmentally, unfriendly process?

For water starved countries/cities, the desalinated Sea water is the main life line. (e.g.) Saudi Arabia (Country)/Chennai (City). How ever a big question arises, when we make potable water from Sea, it is nothing **but "at what cost" in financial, ecological terms and environmental impacts?** Then we are in a dilemma; whether to go for this costly option or not? Even if we undertake this method should we go on an "Extensive level" or "Limited level"? This forces us to take this issue to "Trade Off anvil". Let us view the related points-counter points here under.

Before that, let us understand what is desalinetion and why people do not prefer it? In this Desal plant the water from the Sea is forced through several salt separating membranes and then led into pipe lines for public use. It is an expensive process because it requires enormous amount of energy for its functioning. Further it produces concentrated brine that remains on the coastal lines permanently. Thus it impacts marine environment and causes coastal erosion. This is the main reason for the focused operation it faces now.

Desal plants-can it be a new life line for water scaralg areas?

Point (it cannot)	Counter Point (it can)
i. An expensive method which brings adverse impacts on the coastal environment.	i. It is a climate-independent process. The problems that come in its wings can be solved with better technology like thermal desalinetion method with reverse osmosis process. (e.g.) Thermal Power Station. Condenser rejects are effectively used.
ii. It cannot be a permanent solution.	ii. It is a partial solution for water scarcity. This growing industry will form part of water security in the next 5-10 years.
iii. The cost of production can be brought down from Rs.50 to Rs.15 per 1000 litres, when graphene membranes are employed in Desal plants. These membranes are currently under development.	iii. It can provide one possible solution to World wide water quantity and quality problems, which are Sequel to higher population growth, extreme heat and prolonged drought conditions, linked to global warming and climate change.
iv. An unnatural method-detrimental to the surrounding environment.	iv. There are environmental costs in the emission of GH gases from the large amount of energy used and in the disposal of brine laced with toxic treatment chemicals.
	v. Lack of adequate information makes people to think Desal is bad. In reality it is not so.

Final View

In spite of its detrimental effects and very high cost, desalination plants helped to tide over the water scarcity situations faced by the people in Chennai during the year 2019. Hence it cannot be written off totally; alternatively we have to see how best it can be used to tide over the water scarcity situations expected in summer months.

6. Useful Trade Off Topics/issues

I. Generating station plant load factor vs frequency level of the Grid and the cost of generation.

II. Selection of voltage level for the transmission lines linked to the Grid for the evacuation of Power vs the limitations of the Grid.

III. Selection of protective relay settings vs the capability of the Current Transformer like its Burden and Saturation factor.

IV. Quality of Electrical Power Delivered vs the cost of purification required.

V. Should we go for Auto Transformers or Power Transformers in Transmission Substations?

VI. Need for the earthing of Power System Neutral vs loss of Lives.

VII. Gas Insulated Substation vs Air Insulated Substation w.r.t. Investment and Operating Costs, Maintenance, flexibility of operation that includes renewability of insulating medium and faults attending and space.

VIII. Quality and Quantity of Cement on RCC works vs Factor of Safety.

IX. Energisation of a long Transmission line vs Loss of excitation faced by the generating unit.

X. Wider application of Shunt Capacitors vs its adverse impacts.

XI. Stray Capacitance and Arrester block capacitance vs Metal Oxide Surge Arrester in EHV Power Systems.

XII. Composite Transmission Circuit its energisation, protection needs vs its advantages.

XIII. Application of fixed capacitors across transformers. Its mertis and drawbacks.

XIV. Application of dedicated sub-transmission lines (22 and 11 KV) for feeding limited loads ferro resonance phenomena vs its advantages.

XV. Selection of pole support vs number of conductors to be applied w.r.t. wind load.

XVI. Motor protection-fuse vs Breaker.

XVII. Thermal Power Station – should we go for the exact no of cooling water pumps and FD fans as the generating units or plus one formula. (e.g.) 5 generating units – 5 pumps and 5 fans or 5 + 1 pumps and 5 + 1 fans.

(View it from the angle of energy consumption and the stability of generation.)

XVIII. Percentage of excess air vs combustion of fuel in the boiler in a Thermal Power Station.

XIX. Should be go for the operation of the grid when its frequency falls below the rated frequency level. If so, what level and time?

XX. Loss of vacuum level in an operating Turbine in a Thermal Power Station – upto what level and how long?

XXI. Is it advisable to go for GI conductor for Neutral?

XXII. Over loaded cable vs reliable maintenance of supply with respect to energy losses.

XXIII. Use of copper vs aluminium conductors in electrical networks.

XXIV. Is it advisable to go for Amorphous Core Transformer w.r.t. its cost span and repairs? i.e. its low energy losses vs its vulnerability to failures.

XXV. Operation of welding set with PF correction capacitors. Is it desirable?

XXVI. Blending of coal in Thermal Power Station for better operation. Is it a desirable option?

XXVII. Application of switch mode electronic devices vs Harmonics.

XXVIII. Spares management in Thermal Power Stations – need vs invested cost.

XXIX. How to control a Transformer? Group control breaker vs individual control breaker-Analyse it from the view point of maintenance, flexibility of operation, cost, space and reliability?

XXX. Free Electricity to Agricultural Consumers – is it desirable from the view points of cost, live losses and impacts on the grid?

XXXI. 6% Series Reactor in a capacitor bank – is it desirable to go for the lesser percentage rating of reactor from the view point of switching surges, Harmonics and the over voltage faced by the capacitors in the circuit.

XXXII. Use of Teritiary winding in a star – star auto transformer. Is it desirable from the view point of transformer operation?

XXXIII. Polychlorinated Biphenyls (PCB) in a capacitor. Is it desirable? Analyse it from the view points of its merits vs demerits.

XXXIV. Desired Insulation level of Transmission line vs substation equipment and bus bar.

7. Total Quality Management

The discussion on the present topic (viz.) Trade Off will not be complete without a brief discussion on Total Quality Management which is a Japanese concept. It says that "Bossism" is different from leadership the collective wisdom of the people, who work for the organisation, is always greater than the individual wisdom of the Top Management or other Managers.

- In India TQM fails to bring the desired results because of the attitude of centrism of the industry leaders to the participatory philosophy of the management.
- TQM requires them to delegate the day today decision making process to the people at worksite.
- It also requires the Top Management people to consult and be in touch with people who are in proximity to the problem area. It will facilitate solutions/suggestions easily and quickly.
- You may agree where I say that it is difficult to implement this in our country. Where individualism is predominant. So TQM does not meet with success here.

8. Concluding Remarks

From the discussions so far made, you may find that Trade Off is

- The postponement of the liability for immediate gains, in most of the cases that come under our purview.
- A bargain and a real art.

Unless the contours and dimensions of the problems/issues are clearly reveled to us there lies the possibility of a wrong or inappropriate decision. So have the clarity of all the connected/related issues. Failure to meet this may cause us to move from a frying pan to a landing in fire. Hope you may not prefer this.

With this I would like to conclude my article here.

Please stay tuned till we meet again next month.

(To be continued…)

V. Sankaranarayanan, B.E., FIE,
Former Addl. Chief Engineer/TNEB
E-mail: vsn_4617@rediffmail.com
Mobile: 98402 07703

HUMOUR

PROGRAMMER'S DRINKING SONG

100 little bugs in the code,

100 bugs in the code,

fix one bug, compile it again,

101 little bugs in the code.

101 little bugs in the code.....

Repeat until BUGS = 0

When a programmer goes to bed he sets out 2 glasses on his bedside table:

• One glass is full of water, in case he wants to get a drink

• One glass is empty, in case he doesn't

Two biologists are in the field following the tracks of a radio-collared grizzly bear. All of a sudden, the bear crashes out of the brush and heads right for them. They scramble up the nearest tree, but the bear starts climbing up the tree after them. The first biologist starts taking off his heavy leather hiking boots and pulls a pair of sleek running shoes from his back-pack.

The second biologist gives him a puzzled look and says, "What in the world are you doing?"

He replies, "I figure when the bear gets close to us, we'll jump down and make a run for it."

The second guy says, "Are you crazy? We both know you can't outrun a full-grown grizzly bear."

The first guy says, "I don't have to outrun the bear... I only have to outrun you!"

▪

A lead hardware engineer, a lead software engineer, and their program manager are taking a walk outdoors during their lunch break when they come upon an old brass lamp. They pick it up and dust it off. Poof — out pops a genie.

"Thank you for releasing me from my lamp prison. I can grant you three wishes. Since there are three of you I will grant one wish to each of you."

The hardware engineer thinks a moment and says, "I'd like to be sailing a yacht across the Pacific, racing before the wind, with an all-girl crew." "It is done", said the Genie, and poof, the hardware engineer disappears.

The software engineer thinks a moment and says, "I'd like to be riding my BMW with a gang of beautiful women throughout the American Southwest." "It is done", said the Genie, and poof, the software engineer disappears.

The program manager looks at where the other two had been standing and rubs his chin in thought. Then he tells the Genie, "I'd like those two back in the office after lunch.

Earth provides enough to satisfy every man's needs, but not every man's greed.

– MAHATMA GANDHI

ELECTRICAL THUMB RULE-HIGH RISE BUILDING (As per NBC)

Luminous Efficacy, Life, Lumen Maintenance and Color Rendition (Table-8) NBC

Light Source	Wattage	Efficacy (lm/W)	Average Life	Maintenance	Colour Rendition
Incandescent lamps	15 to 200	12 to 20	500 to 1000	Fair to good	Very good
Tungsten halogen	300 to 1500	20 to 27	200 to 2000	Good to very good	Very good
Standard fluorescent lamps	20 to 80	55 to 65	5000	Fair to good	Good
Compact fluorescent lamps (CFL)	5 to 40	60 to 70	7500	Good	Good to very good
Slim line fluorescent	18 to 58	57 to 67	5000	Fair to good	Good
High pressure mercury vapor lamps	60 to 1000	50 to 65	5000	Very low to fair	Federate
Blended – light lamps	160 to 250	20 to 30	5000	Low to fair	Federate
High pressure sodium vapor lamps	50 to 1000	90 to 125	10000 to 15000	Fair to good	Low to good
Metal halide lamps	35 to 2000	80 to 95	4000 to 10000	Very low	Very good
Low pressure sodium	10 to 180	100 to 200	10000 to 20000	Good to very good	Poor
LED	0.5 to 2.0	60 to 100	10000	Very good	Good for white LED

Approximate Cable Current Capacity

Cable Size	Current Capacity	MCB Size
1.5 Sq.mm	7.5 To 16 A	8A
2.5 Sq.mm	16 To 22 A	15A
4 Sq.mm	22 To 30 A	20A
6 Sq.mm	39 To 39 A	30A
10 Sq.mm	39 To 54A	40A
16 Sq.mm	54 To 72A	60A
25 Sq.mm	72 To 93A	80A
50 Sq.mm	117 To 147A	125A
70 Sq.mm	147 To 180A	150A
95 Sq.mm	180 To 216A	200A
120 Sq.mm	216 To 250A	225A
150 Sq.mm	250 To 287A	275A
185 Sq.mm	287 To 334A	300A
240 Sq.mm	334 To 400A	350A

Requirements for Physical Protection of Underground Cables (As per NBC)

Protective Element	Specifications
Bricks	(a) 100 mm minimum width
	(b) 25 mm thick
	(c) sand cushioning 100 mm and sand cover 100 mm
Concrete slabs	At least 50 mm thick
Plastic slabs (polymeric cover strips) Fiber reinforced plastic	depending on properties and has to be matched with the protective cushioning and cover
PVC conduit or PVC pipe or stoneware pipe or Hume pipe	The pipe diameter should be such so that the cable is able to easily slip down the pipe
Galvanized pipe	The pipe diameter should be such so that the cable is able to easily slip down the pipe
The trench shall be back filled to cover the cable initially by 200 mm of sand fill; and then a plastic marker strip hall be put over the full length of cable in the trench.	
The marker signs shall be provided where any cable enters or leaves a building. This will identify that there is a cable located underground near the building.	
The trench shall then be completely filled. If the cables rise above ground to enter a building or other structure, a mechanical protection such as a GI pipe or PVC pipe for the cable from the trench depth to a height of 2.0 m above ground shall be provided.	

AREA REQUIRED FOR GENERATOR IN ELECTRIC SUBSTATIOIN (As per NBC)

Capacity kVA	Area m^2	Clear Height below the Soffit of the Beam m
25	56	3.6
48	56	3.6
100	65	3.6
150	72	3.6
248	100	4.2
350	100	4.2
480	100	4.2
600	110	4.6
800	120	4.6
1010	120	6.5
1250	120	6.5
1600	150	6.5
2000	150	6.5

Low Voltage Cabeling for Building (As per NBC)	
Low Voltage Cable	Cables/wires, such as fiber optic cable, co-axial cable, etc. These shall be laid at least at a distance of 300 mm from any power wire or cable. The distance may be reduced only by using completely closed earthed metal trucking with metal separations for various kind of cable. Special care shall be taken to ensure that the conduit runs and wiring are laid properly for low voltage signal to flow through it.
	The power cable and the signal or data cable may run together under floor and near the equipment. However, separation may be required from the insulation aspect, if the signal cable is running close to an un-insulated conductor carrying power at high voltage. All types of signal cables are required to have insulation level for withstanding 2 kV impulse voltages even if they are meant for service at low voltage.
Conduit Colour Scheme	Power conduit = Black Security conduit = Blue Fire alarm conduit = Red Low voltageconduit = Brown UPS conduit Green
Sub Station Guideline (As per NBC)	
Substation Location	Location of substation in the basement should be avoided, as far as possible.
	If there is only one basement in a building, the substation/switch room shall not be provided in the basement and the floor level of the substation shall not be lowest point of the basement.
	Substation shall not be located immediately above or below plumbing water tanks or sewage treatment plant (STP) water tanks at the same location
Substation Door/Shutter	All door openings from substation, electrical rooms, etc, should open outwards
	Vertical shutters (like rolling shutters) may also be acceptable provided they are combined with a single leaf door opening outwards for exit in case of emergency
	For large substation room/electrical room having multiple equipment, two or more doors shall be provided which shall be remotely located from each other
	No services or ventilation shafts shall open into substation or switch room unless specific to substation or switch room
Transformer Location	In case of HV panel and transformers located at different floors or at a distance more than 20m, HV isolator shall be provided at transformer end
	In case transformer and main MV/LV panel room are located at different floors or are at a distance more than 20m, MV/LV isolator shall be provided at transformer end
	In case of two transformers (dry type or transformers with oil quantity less than 2000 litre) located next to each other without intermittent wall, the distance between the two shall be minimum 1500mm for 11 kV, minimum 2000mm for 22 kV and minimum 2 500 mm for 33 kV. Beyond 33 kV, two transformers shall be separated by baffle wall of 4 h fire rating.
	If dry type transformer is used, it may be located adjacent to medium voltage switchgear in the form of unit type substation. In such a case, no separate room or fire barrier for

	the transformer is required either between transformers or between transformer and the switchgear, thereby decreasing the room space requirement; however, minimum distances as specified.
Oil Filled Equipment (Transformer / C.B)	Substations with oil-filled equipment/apparatus transformers and high voltage panels shall be either located in open or in a utility building
	They shall not be located in any floor other than the ground floor or the first basement of a utility building not be located below first basement slab of utility building.
	They shall have direct access from outside the building for operation and maintenance of the equipment.
	It shall be separated from the adjoining buildings including the main building by at least 6m clear distance to allow passage of fire tender between the substation/utility building and adjoining building/main building.
	Substation equipment having more than 2000 litre of oil whether located indoors in the utility building or outdoors shall have baffle walls of 4 h fire rating between apparatus.
	Provision of suitable oil soak-pit, and where use of more than 9000 litre of oil in any one oil tank, receptacle or chamber is involved, provision shall be made for the draining away or removal of any oil which may leak or escape from the tank, receptacle or chamber containing the same
Power Supply Voltage	Supply is at 240 V single phase up to 5 kVA, 415/240 V 3-phase from 5 kVA to 100 kVA, 11 kV (or 22 kV) for loads up to 5 MVA and 33 kV or 66 kV for consumers of connected load or contract demand more than 5 MVA.
	In case of connected load of 100 kVA and above, the relative advantage of high voltage three-phase supply should be considered.
	In case of single point high voltage metering, energy meters shall be installed in building premise, such a place which is readily accessible to the owner/operator of the building and the Authority. The supplier or owner of the installation shall provide at the point of commencement of supply a suitable isolating device fixed in a conspicuous position at not more than 1.7 m above the ground so as to completely isolate the supply to the building in case of emergency
Trench Drain	In case of cable trench in substation/HV switch room/MV switch room, the same shall be adequately drained to ensure no water is stagnated at any time with live cables.
Fence for Substation	Enclose any part of the substation which is open to the air, with a fence (earthed efficiently at both ends) or wall not less than 1800mm (preferably not less than 2400mm) in height
HV Distribution in Building	The power supply HV cables voltage shall not be more than 12 kV and a separate dedicated and fire compartmented shaft should be provided for carrying such high voltage cables to upper floors in a building. These shall not be mixed with any other shaft and suitable fire detection and suppression measures shall be provided throughout the length of the cable on each floor.
Switch Room / MV switch room	Switch room / MV switch room shall be arrived at considering 1200mm clearance requirement from top of the equipment to the below of the soffit of the beam .In case cable entry/exit is from above the equipment (transformer, HV switchgear, MV switchgear), height of substation room/HV switch room/MV switch room shall also take into account requirement of space for turning radius of cable above the equipment height. *Courtesy: Jignesh.parmar*

ELECTRICAL QUESTION & ANSWER PART - 2

16. What is reverse power relay?

- Reverse Power flow relay are used in generating stations' protection.
- A generating station is supposed to feed power to the grid and in case generating units are off, there is no generation in the plant then plant may take power from grid. To stop the flow of power from grid to generator we use reverse power relay.

17. What will happen if DC supply is given on the primary of a transformer?

- Mainly transformer has high inductance and low resistance. In case of DC supply there is no inductance, only resistance will act in the electrical circuit. So high electrical current will flow through primary side of the transformer. So for this reason coil and insulation will burn out
- When AC current flow to primary winding it induced alternating flux which also link to secondary winding so secondary current flow in secondary winding according to primary current. Secondary current also induced emf (Back emf) in secondary winding which oppose induced emf of primary winding and thus control primary current also.
- If DC current apply to Primary winding than alternating flux is not produced so no secondary emf induced in secondary winding so primary current may goes high and burn transformer winding.

18. Different between megger and contact resistance meter?

- Megger used to measure cable resistance, conductor continuity, phase identification whereas contact resistance meter used to measure low resistance like relays, contactors.

19. When we connect the capacitor bank in series?

- We connect capacitor bank in series to improve the voltage profile at the load end in transmission line there is considerable voltage drop along the transmission line due to impedance of the line. so in order to bring the voltage at the load terminals within its limits i.e (+ or – %6) of the rated terminal voltage the capacitor bank is used in series

20. What is Diversity factor in electrical installations?

- Diversity factor is the ratio of the sum of the individual maximum demands of the various subdivisions of a system, or part of a system, to the maximum demand of the whole system, or part of the system, under consideration. Diversity factor is usually more than one.

21. Why humming sound occurred in HT transmission line?

- This sound is coming due to ionization (breakdown of air into charged particles) of air around transmission conductor. This effect is called as Corona effect, and it is considered as power loss.

22. Why frequency is 50 hz only & why should we maintain the frequency constant?

- We can have the frequency at any frequency we like, but then we must also make our own motors, transformers or any other equipment we want to use.
- We maintain the frequency at 50 Hz or 60hz because the world maintains a standard at 50 /60hz and the equipments are made to operate at these frequency.

23. If we give 2334 A, 540V on Primary side of 1.125 MVA step up transformer, then what will be the Secondary Current, If Secondary Voltage=11 KV?

- As we know the Voltage & current relation for transformer-V1/V2 = I2/I1

  We Know, VI= 540 V; V2=11KV or 11000 V; I1= 2334 Amps.

  By putting these value on Relation-

  540/11000= I2/2334

  So, I2 = 114.5 Amps

24. What are the points to be considered for MCB (miniature circuit breaker selection)?

- I(L)x1.25=I(MAX) maximum current. Mcb specification is done on maximum current flow in circuit.

25. How can we start-up the 40w tube light with 230v AC/DC without using any choke/Coil?

- It is possible by means of Electronic choke. Otherwise it's not possible to ionize the particles in tube. Light, with normal voltage.

26. What is "pu" in electrical engineering?

- Pu stands for per unit and this will be used in power system single line diagram there it is like a huge electrical circuit with no of components (generators, transformers, loads) with different ratings (in MVA and KV). To bring all the ratings into common platform we use pu concept in which, in general largest MVA and KV ratings of the component is considered as base values, then all other component ratings will get back into this basis. Those values are called as pu values. (p.u=actual value/base value).

27. Why link is provided in neutral of an ac circuit and fuse in phase of ac circuit?

- Link is provided at a Neutral common point in the circuit from which various connections are taken for the individual control circuit and so it is given in a link form to withstand high Amps.
- But in the case of Fuse in the Phase of AC circuit it is designed such that the fuse rating is calculated for the particular circuit (i.e load) only. So if any malfunction happens the fuse connected in the particular control circuit alone will blow off.
- If Fuse is provided in Neutral and if it is blowout and at the same time Supply is on than due to open or break Neutral Voltage is increase and equipment may be damage.

28. If 200w, 100 w and 60 w lamps connected in series with 230V AC , which lamp glow brighter? Each lamp voltage rating is 230V.

- Each bulb when independently working will have currents (W/V= I)
- For 200 Watt Bulb current (I200) =200/230=0.8696 A
- For 100 Watt Bulb current (I100) =100/230=0.4348 A
- For 60 Watt Bulb current (I60) =60/230=0.2609 A
- Resistance of each bulb filament is (V/I = R)
- For 200 Watt Bulb R200= 230/0.8696= 264.5 ohms
- For 100 Watt Bulb R100= 230/0.4348 = 528.98 ohms and
- For 60 Watt Bulb R60= 230/0.2609=881.6 ohms respectively
- Now, when in series, current flowing in all bulbs will be same. The energy released will be I^2R
- Thus, light output will be highest where resistance is highest. Thus, **60 watt bulb will be brightest.**
- The 60W lamp as it has highest resistance & minimum current requirement.
- Highest voltage drop across it X I [which is common for all lamps] =s highest power.
- **Note to remember:**
- Lowest power-lamp has highest element resistance.
- And highest resistance will drop highest voltage drop across it in a Series circuit
- And highest resistance in a parallel circuit will pass minimum current through it. So minimum power dissipated across it as min current X equal Voltage across =s min power dissipation

29. How to check Capacitor with use of Multi meter.

- Most troubles with Capacitors either open or short.
- An ohmmeter (multi meter) is good enough. A shorted Capacitor will clearly show very low resistance. A open Capacitor will not show any movement on ohmmeter.
- A good capacitor will show low resistance initially, and resistance gradually increases. This shows that Capacitor is not bad. By shorting the two ends of Capacitor (charged by ohmmeter) momentarily can give a weak spark. To know the value and other parameters, you need better instruments

30. What is the difference between Electronic regulator and ordinary rheostat regulator for fans?

- The difference between the electronic and ordinary regulator is that in electronic regulator power losses are less because as we decrease the speed the electronic regulator give the power needed for that particular speed .But in case of ordinary rheostat type regulator the power wastage is same for every speed and no power is saved. In electronic regulator triac is employed for speed control, by varying the firing angle speed is controlled but in rheostat control resistance is decreased by steps to achieve speed control.

31. What will happen when power factor is leading in distribution of power?

- If there is high power factor, i.e if the power factor is close to one:
- Losses in form of heat will be reduced,
- Cable becomes less bulky and easy to carry, and very cheap to afford.
- It also reduces over heating of transformers.

32. What is the main difference between UPS & inverter?

- Uninterrupted power supply is mainly use for short time. Means according to ups VA it gives backup. Ups is also two types: on line and offline. Online ups having high volt and amp for long time backup with high dc voltage. But ups start with 12v dc with 7 amps but inverter is start with 12v, 24 dc to 36 dc and 120amp to 180amp battery with long time backup.

33. Which type of A.C motor is used in the fan?

- It is Single Phase induction motor which mostly squirrel cage rotor and are capacitor start capacitor run.

34. What is the difference between synchronous generator and asynchronous generator?

- In simple, synchronous generator supplies' both active and reactive power but asynchronous generator (induction generator) supply's only active power and observe reactive power for magnetizing. This type of generators is used in windmills.

35. What is the Polarization index value?

- Its ratio between insulation resistance (IR) i.e meager value for 10min to insulation resistance for 1 min. It ranges from 5-7 for new motors & normally for motor to be in good condition it should be Greater than 2.5.

36. What is Automatic Voltage regulator (AVR)?

- AVR is an abbreviation for Automatic Voltage Regulator.
- It is important part in Synchronous Generators; it controls the output voltage of the generator by controlling its excitation current. Thus it can control the output Reactive Power of the Generator.

37. Difference between a four point starter and three point starters?

- The shunt connection in four point starter is provided separately from the line where as in three point starter it is connected with line which is the drawback in three point starter

38. What happens if we connect a capacitor to a generator load?

- Connecting a capacitor across a generator always improves power factor, but it will help depends up on the engine capacity of the alternator, otherwise the alternator will be over loaded due to the extra watts consumed due to the improvement on pf.
- Don't connect a capacitor across an alternator while it is picking up or without any other load

39. Why the capacitors work on ac only?

- Generally capacitor gives infinite resistance to dc components (i.e., block the dc components). It allows the ac components to pass through.

40. Why the up to dia 70mm² live conductor, the earth cable must be same size but above dia 70mm² live conductor the earth conductor need to be only dia 70mm²?

- DOL: direct online starter
- The current carrying capacity of a cable refers to it **carrying a *continuous* load.**
- An earth cable normally carries no load, and under fault conditions will carry a **significant *instantaneous* current but only for a short time** most Regulations define 0.1 to 5 sec before the fuse or breaker trips. Its size therefore is defined by different calculating parameters.
- The magnitude of earth fault current depends on:
- (a) the external earth loop impedance of the installation (i.e. beyond the supply terminals)
- (b) the impedance of the active conductor in fault
- (c) the impedance of the earth cable.
- i.e. **Fault current = voltage / a + b + c**
- Now when the active conductor (b) is small, its impedance is much more than (a), so the earth (c) cable is sized to match. As the active conductor gets bigger, its impedance drops significantly below that of the external earth loop impedance (a); when It is quite large its impedance can be ignored. At this point there is no merit in increasing the earth cable size
- i.e**. Fault current = voltage / a + c**
- (c) is also very small so the fault current peaks out.
- The neutral conductor is a separate issue. It is defined as an active conductor and therefore must be sized for continuous full load. In a 3-phase system,
- If balanced, no neutral current flows. It used to be common practice to install reduced neutral supplies, and cables are available with say half-size neutrals (remember a neutral is always necessary to provide single phase voltages). However the increasing use of non-linear loads which produce harmonics has made this practice dangerous, so for example the current in some standard require full size neutrals. Indeed, in big UPS installations I install double neutrals and earths for this reason.

Courtesy: Jignesh.parmar

For in the true nature of things, if we rightly consider, every green tree is far more glorious than if it were made of gold and silver. - MARTIN LUTHER KING JR.

PRINCIPLES OF SOLAR ENGINEERING

Introduction to Solar Energy Conversion

A thing that will assume enormous importance quite soon is the exhaustion of our fuel resources. Coal and oil have been accumulating in the earth over five hundred million years, and at the present rates of demand for mechanical power, the estimates are that oil will be all gone in about a century, and coal probably in a good deal less than five hundred years. For the present purpose, it does not matter if these are under-estimates; they could be doubled or trebled and still not affect the argument. Mechanical power comes from our reserves of energy, and we are squandering our energy capital quite recklessly. It will very soon be all gone, and in the long run we shall have to live from year to year on our earnings (Darwin 1953).

Charles Galton Darwin , *(grandson of Charles Darwin)*

The only energy earnings or income we have is the direct radiative energy from the sun (Daniels 1964). Fossil fuels are the stored form of the sun's energy, representing our energy savings or energy capital. In addition, we have the indirect forms of solar energy (wind, biomass, ocean, and hydro), geothermal energy, and nuclear energy in radioactive materials. It is clear that we have been using the energy capital at unsustainable rates over the last 100 years while throwing away our energy earnings, the direct energy from the sun. However, there is concerted effort throughout the world to change it. As we move toward a future where solar energy will play a far greater role, education of students in the science and engineering of solar energy has become extremely important and urgent. This book fills that need.

This book assumes that the reader is familiar with traditional thermodynamics, basic heat transfer, and fluid mechanics and has knowledge of calculus and ordinary differential equations. Some elements of radiation, fluid mechanics, and heat transfer specific to solar engineering are presented in the text. The design and analysis of solar utilization schemes are approached from a systems-analysis viewpoint, which combines technical design with economic analysis. There is no single solution to a given task in solar energy utilization and each problem must be analyzed separately from fundamental principles.

1.1 Global Energy Needs and Resources

Global energy consumption in the last half-century has rapidly increased and is expected to continue to grow over the next 50 years but with significant differences. The past increase was stimulated by relatively "cheap" fossil fuels and increased rates of industrialization in North America, Europe, and Japan; yet while energy consumption in these countries continues to increase, additional factors make the picture for the next 50 years more complex. These additional complicating factors include China's and India's rapid increase in energy use as they represent approximately one-third of the world's population, the expected depletion of oil resources in the near future, and the effect of human activities on global climate change. On the positive side, the renewable energy (RE) technologies of wind, biofuels, solar thermal, and photovoltaics (PV) are finally showing maturity and the ultimate promise of cost competitiveness.

The total primary energy demand in the world increased from 5536 million tons of oil equivalent (MTOE) in 1971 to 10,345 MTOE in 2002, representing an average annual increase of 2% (Figure 1).

By 2008, the world energy demand had increased to 12,271 MTOE, representing an average annual increase of approximately 3%. The main reason for a 50% increase in the annual rate is the fast-growing energy demand in the Asia Pacific, more specifically China. Since the per capita energy used in the most populous countries (China and India) is still very small, the global energy use may continue to increase at this extremely high rate. Since 2008,

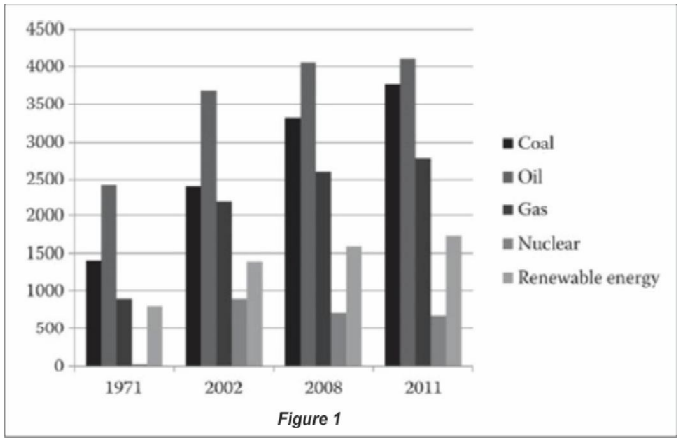


Figure 1

World primary energy demand (MTOE). (Data from IEA, World Energy Outlook 2005, International Energy Agency, Paris, France, 2005; IEA, World Energy Outlook 2010, International Energy Agency, Paris, France, 2010; IEA, World Energy Outlook 2013, International Energy Agency, Paris, France, 2013.)

Introduction to Solar Energy Conversion

The average annual energy increase dropped to approximately 2.1%, mainly because of the deep recession in the United States and Europe where the energy use actually went down.

Even at a 2% increase per year, the primary energy demand of 12,271 MTOE in 2008 would double by 2043 and triple by 2063. Of course, the global energy use cannot continue to increase at the same rate forever. The International Energy Agency (IEA 2010) estimated that the global energy use will increase at an average annual rate of 1.2% up to 2035. Even at that optimistic rate, the global energy use will increase by 38% by 2035, reaching a value of 16,934 MTOE per year. A review of the present energy resources and their availability (Kreith and Goswami 2007; WBGU 2003) shows that as much as 50% of the global energy use in 2050 will have to come from RE sources, a vast majority being from solar energy and wind. With a view to meet the future demand of primary energy in 2050 and beyond, it is important to know the extent of available RE resources and their ability to fulfill our energy needs for buildings, food, water, transportation, industry, and electrical power. This book presents the availability of solar energy, methods of conversion to useful forms, various applications, methods of design, and economic analysis.

1.1.1 Present Status and Potential of RE

According to the data in Table 1.1, RE accounted for 13.2% of the world's total primary energy supply in 2011. However, approximately 75% of the RE supply was from biomass, and in developing countries, it is mostly converted by traditional open combustion, which is very inefficient. Because of its inefficient use, biomass resources presently supply only approximately 20% of what they could if converted by modern, more efficient, available technologies.

The total share of all renewables for electricity production in 2011 was approximately 20.1%, a vast majority (78%) of it being from hydroelectric power (Figure 2). Even though worldwide solar power capacity represented only 1.4% of the total electricity capacity, it was growing at an average annual rate of approximately 50%.

Table 1

2011 Fuel Shares in World Total Primary Energy Supply

Source	Share
Oil	31.4%
Natural gas	21.3%
Coal	28.9%
Nuclear	5.2%
Renewables	13.2%

Source: IEA, *World Energy Outlook 2013,* International Energy Agency, Paris, France, 2013.

2011 Renewable resource shares in world electricity capacity. (Data from IEA, *World Energy Outlook 2013*, International Energy Agency, Paris, France, 2013)

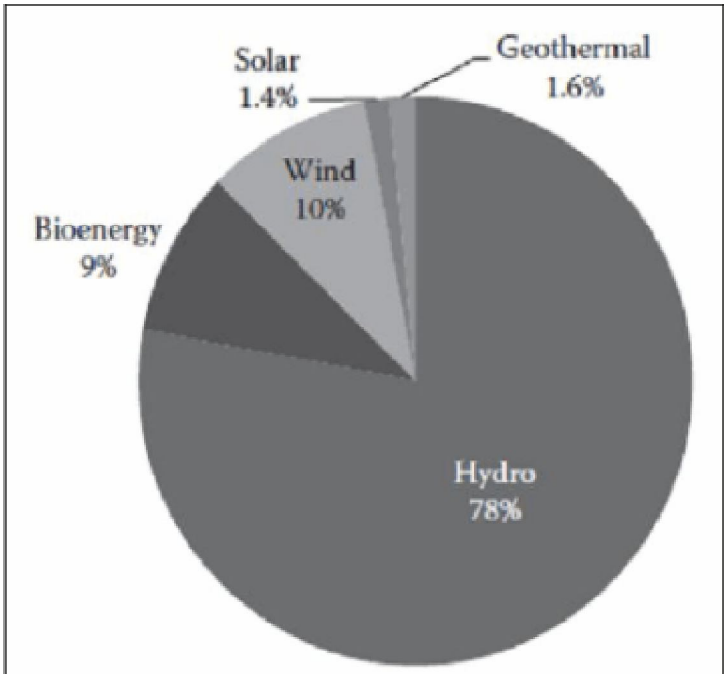


Figure 2

1.1.2 Wind Power

The utilization of wind power has been widespread since medieval times. Windmills were used in rural United States to power irrigation pumps and drive small electric generators used to charge batteries that provided electricity during the last century. A windmill or wind turbine converts the kinetic energy of moving air into mechanical motion, usually in the form of a rotating shaft. This mechanical motion can be used to drive a pump or to generate electric power. The energy content of the wind increases with the third power of the wind velocity and wind power installations are economical in regions where winds of sufficient strength and regularity occur.

Wind energy technology has progressed significantly over the last two decades. The technology has been vastly improved and capital costs have come down to as low as $1000/kW. At this level of capital costs, wind power is already economical at locations with fairly good wind resources. Therefore, the average annual growth in worldwide wind energy capacity from 2001 to 2012 was over 25% (Figure 1.3). The average growth in the United States over the same period was 37.7%. The total worldwide installed wind power capacity, which was 24 GW in 2001 (Figure 3), reached a level of 282 GW in 2012 (WWEA 2012). The world's total theoretical potential for onshore wind power is around 55 TW with a practical potential of at least 2 TW (UNDP 2004), which is approximately 40% of the entire present worldwide generating capacity. The offshore wind energy potential is even larger.

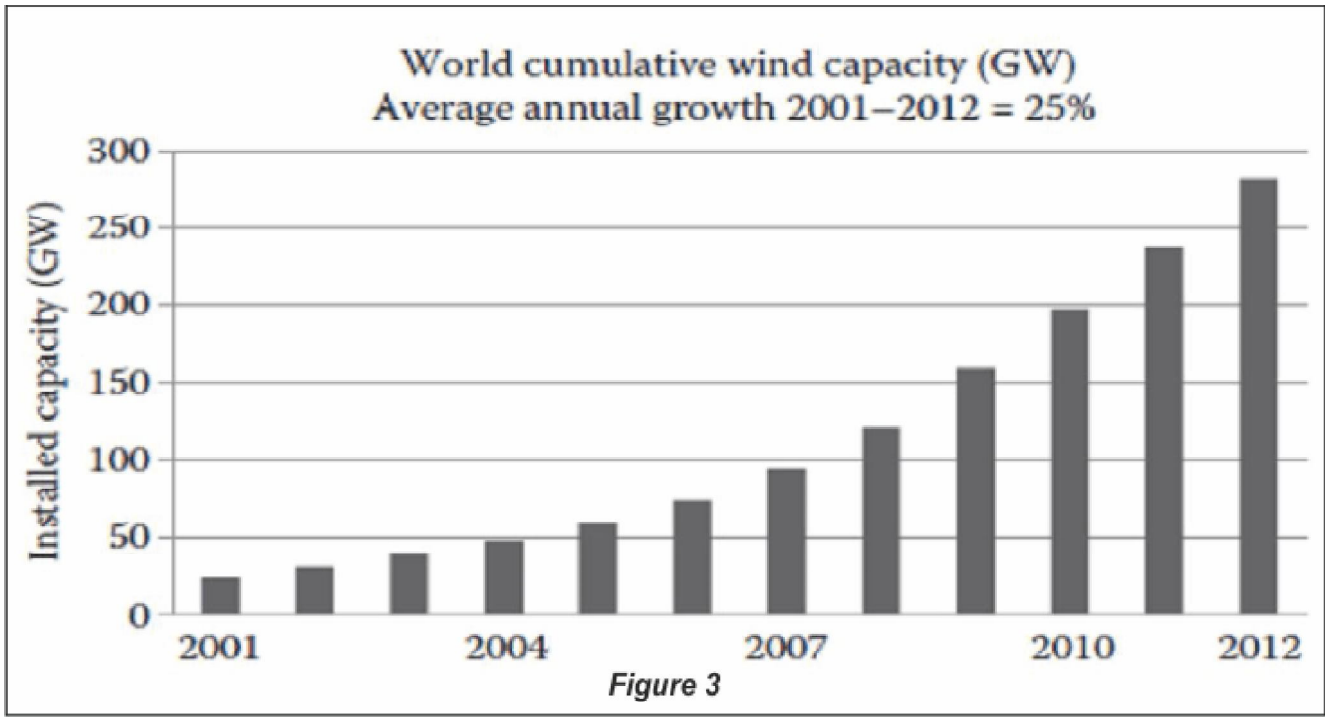


Figure 3

World total wind power installed capacity. (From WWEA 2012, *http://www.wwindea.org/webimages/WorldWindEnergyReport2012_final.pdf.*)

Wind power is an indirect form of solar energy; however, it will not be covered in this book. Instead, it will be covered in detail in a companion book on RE being published separately.

1.1.3 Biomass

Although theoretically harvestable biomass energy potential is of the order of 90 TW, the technical potential on a sustainable basis is of the order of 8–13 TW or 270–450 exajoules/year. This potential is 3–4 times the present electrical generation capacity of the world. It is estimated that by 2025, even municipal solid waste (MSW) could generate up to 6 exajoules/year.

The biggest advantage of biomass as an energy resource is its relatively straightforward transformation into transportation fuels. Biofuels have the potential to replace as much as 75% of the petroleum fuels in use for transportation in the United States (Worldwatch Institute 2006). This is especially important in view of the declining oil supplies worldwide. Biofuels will not require additional infrastructure development. Therefore, development of biofuels is being viewed very favorably by governments around the world. Biofuels, along with other transportation options such as electric vehicles and hydrogen, will help diversify the fuel base for future transportation. Table 1.2 and Figure 1.4 show the global production of biofuels from 2001 to 2011. United States, Brazil, and Europe are the top producing countries and region of the world. Biofuel production grew more than 5 times in 10 years, although it started from a much smaller base. In 2005, the world ethanol production had reached approximately 36 billion litres per year while biodiesel production topped 3.5 billion litres during the same year.

Table 2 - Total Biofuel Production (Thousand Barrels per Day)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
United States	115.7	140.3	183.9	223.3	260.6	335.0	457.3	649.7	747.1	889.8	971.7
Brazil	197.6	216.9	249.4	251.7	276.4	307.3	395.7	486.3	477.5	527.1	438.1
Europe	21.2	29.3	39.3	48.9	76.8	123.9	153.8	198.1	233.2	255.2	250.5
Asia	3.1	8.3	17.2	21.1	28.2	44.9	49.2	75.6	93.8	99.8	118.2
Rest of the World	5.3	8.6	9.6	9.8	14.2	29.6	47.3	67.7	83.8	93.3	118.8
World	342.9	403.5	499.4	554.8	656.3	840.6	1103.3	1477.3	1635.4	1865.4	1897.2

Source: Enerdata. *Global Energy Statistial Yearbook 2013*, Enerdata Information Services, London, UK, 2013,

http://www.enerdata.net; IEA, *World Energy Outlook 2013*, Internatinal Energy Agnecy, Paris, France, 2013

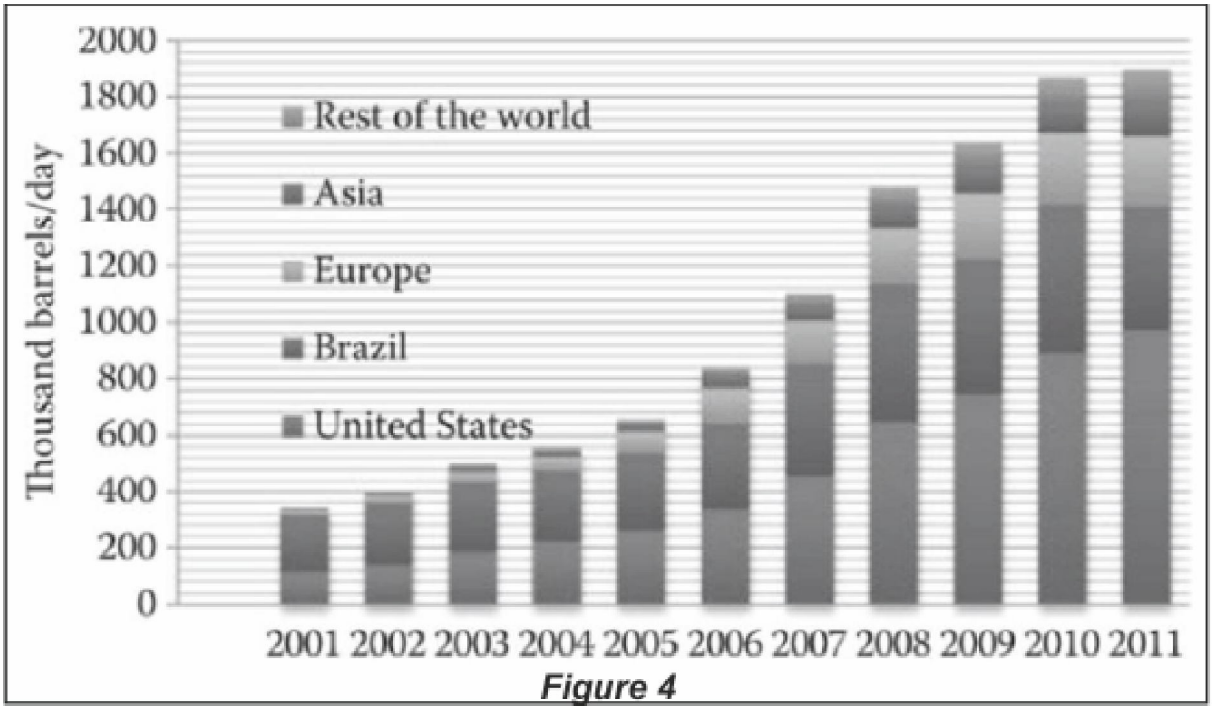


Figure 4

World biofuel production, 2001–2011. (From IEA, *World Energy Outlook 2013*, International Energy Agency, Paris, France, 2013)

Cost ranges for ethanol and gasoline production, 2006. (From Worldwatch Institute, Biofuels for Transportation—Global Potential and Implications for Sustainable Energy in the 21st Century, Worldwatch Institute, Washington, DC, 2006)

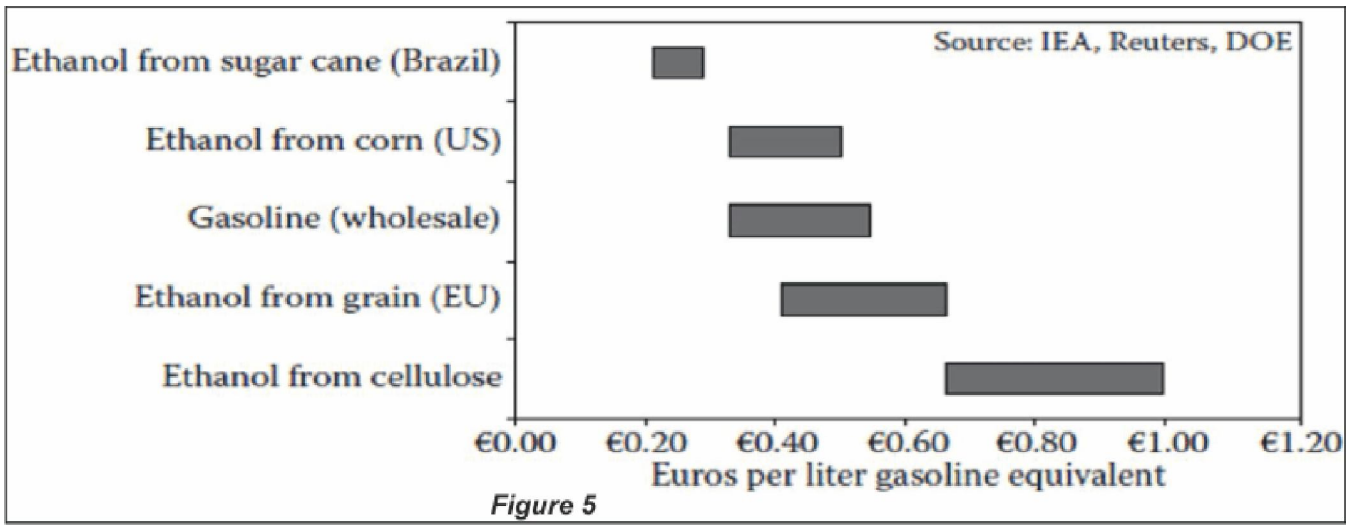


Figure 5

The present cost of ethanol production ranges from approximately 25 Euro cents to approximately 1 Euro per gasoline equivalent liter, as compared to the wholesale price of gasoline, which is between 40 and 60 Euro cents per liter (Figure 1.5). Biodiesel costs, on the other hand, range between 20 Euro cents to 65 Euro cents per liter of diesel equivalent (Figure 1.6). Figure 1.7 shows the feedstock used for these biofuels. An important consideration for biofuels is that the fuel should not be produced at the expense of food while there are people going hungry in the world. This would not be of concern if biofuels were produced from MSW or nonfood forest resources.

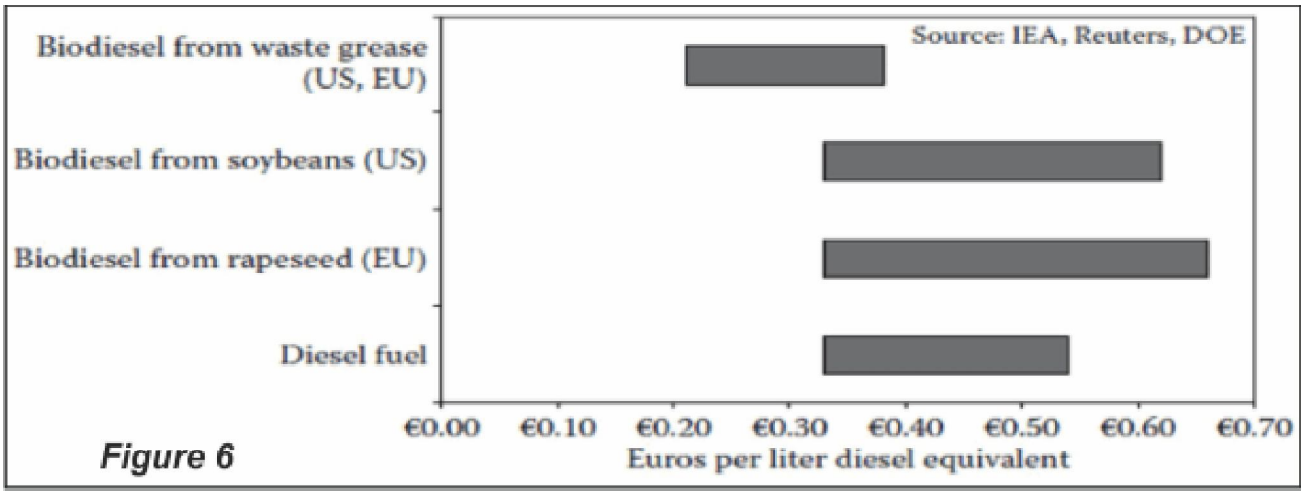


Figure 6

Cost ranges for biodiesel and diesel production, 2006. (From Worldwatch Institute, Biofuels for Transportation—Global Potential and Implications for Sustainable Energy in the 21st Century, Worldwatch Institute, Washington, DC, 2006)

Biofuel yields of selected ethanol and biodiesel feedstock. (From Worldwatch Institute, Biofuels for Transportation—Global Potential and Implications for Sustainable Energy in the 21st Century, Worldwatch Institute, Washington, DC, 2006)

According to the Worldwatch Institute report, a city of 1 million people produces approximately 1800 tons of MSW and 1300 tons of organic waste every day, which using the present-day technology could produce enough fuel to meet the needs of 58,000 persons in the United States, 360,000 in France, and nearly 2.6 million in China at current rates of per capita fuel use (Worldwatch Institute 2006).

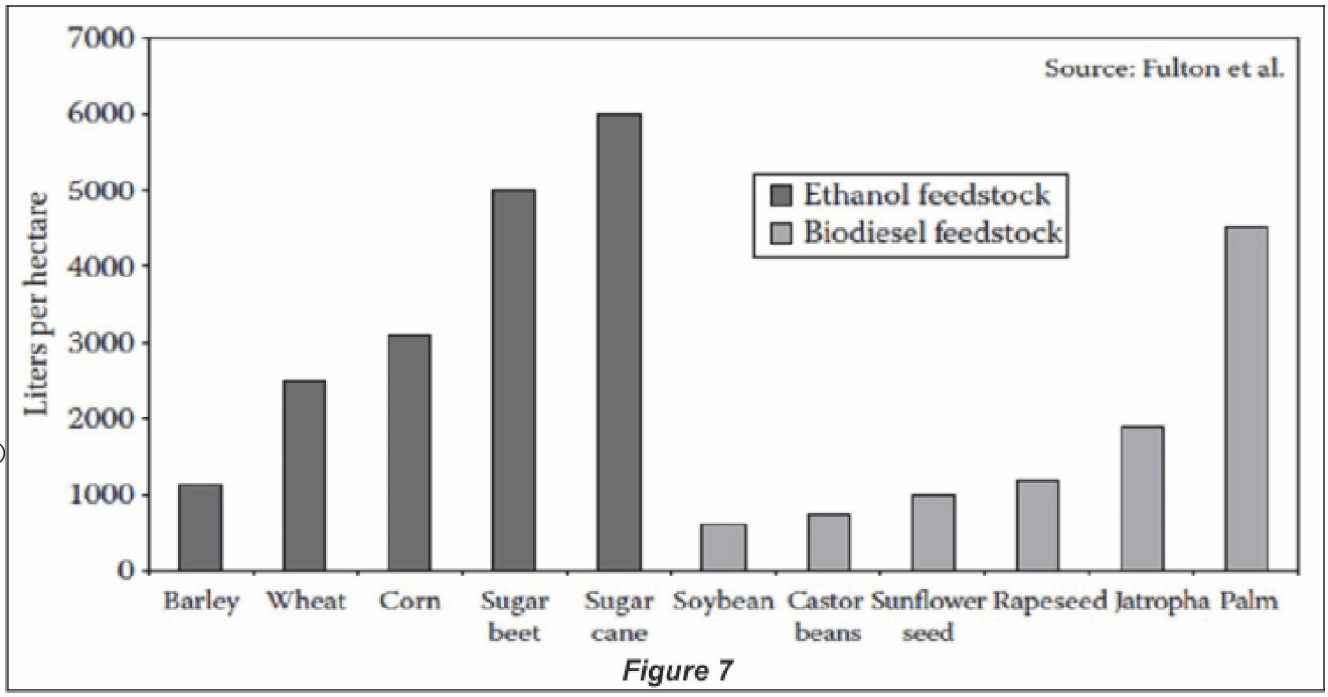


Figure 7

1.1.4 Ocean Energy Conversion

Almost 71% of the world's surface is covered by oceans. Oceans serve as a tremendous storehouse of solar energy because of the temperature differences produced by the sun as well as the kinetic energy stored in the waves. There are a number of places in the ocean where temperature differences of the order of 20–25 K exist at depths of less than 1000 m, and these temperature differences could be used to operate low-pressure heat engines. Although the thermodynamic efficiency of a heat engine operating on such a small temperature difference is low, the available amount of thermal energy is very large. However, putting this energy-conversion method into practice requires the development of efficient and cheap heat exchangers that can withstand the rough marine conditions. Since heat-exchange equipment is the most expensive part of any ocean thermal conversion scheme, the cost of using the temperature gradients in the ocean for practical solar energy utilization depends largely on this development.

The second method of utilizing the oceans for energy generation is through ocean waves. Energy in ocean currents and waves is kinetic energy, which can be converted to power by specially designed turbines. Energy from tides can be harnessed by constructing a dam to hold seawater at a higher elevation when the tide is high and letting it run a turbine when the tide is low. According to an Electric Power Research Institute study, the total ocean wave and tidal power resource potential for the United States is approximately 2100 TWh/year (EPRI 2007), of which approximately 260 TWh/year could be credibly harnessed. Ocean energy conversion will not be treated in this text. Instead, it will be covered in detail in a companion text on RE conversion.

(To be continued)

Courtesy: D. Yogi Goswami

God is the friend of silence. See how nature – trees, flowers, grass- grows in silence; see the stars, the moon and the sun, how they move in silence... We need silence to be able to touch souls. – MOTHER TERESA

QUICK REFERENCE-FIRE FIGHTING (Part - 2)

Size of the Mains for Fire Fighting as per Type of Building (IS 3844)

Mains of Fire Fighting	Type of Building	Building Height
100 mm single outlet landing valves	**I) Residential buildings (A)**	
	a) Lodging housing	15 Meter to 45 Meter
	b) Dormitory	15 Meter to 45 Meter
	c) Family private dwellings	15 Meter to 45 Meter
	d) Apartment houses	15 Meter to 45 Meter
	e) With shopping area not exceeding 250 m^2	15 Meter to 45 Meter
	f) Hotel buildings up to 3 star grade	15 Meter to 24 Meter and area not exceeding 600m^2 per floor
100mm single outlet landing valves	II) Educational buildings (B)	Above 15m but not exceeding 35m
100mm single outlet landing valves	III) Institutional buildings (C)	Above 15m but not exceeding 35m
100mm single outlet landing valves	a) For hospitals and sanatorium with beds not exceeding 100no's	Above 15m but not exceeding 25m
100mm single outlet landing valves	b) For custodial places and mental institutions	Above 15m but not exceeding 35m
100mm single outlet landing valves	IV) Assembly buildings (D)	Above 15m but not exceeding 24m and total floor area not exceeding 500 m^2/floor
100mm single outlet landing valves	V) Business buildings (E)	Above I5m but not exceeding 24m
100mm single outlet landing valves	VI) Mercantile buildings (F)	Above 15m but not exceeding 24m
100mm single outlet landing valves	VII) Industrial buildings (G)	Above 15m but not exceeding 24m
150mm with twin outlet landing	VIII) All buildings classified under (I) To (IV)	Above 45m
150mm with twin outlet landing	IX) All buildings classified under(v) above with shopping area not exceeding 250 m^2	Above 24m
150mm with twin outlet landing	X) All buildings classified under (vi) above	Above 24m and area exceeding 600 m^2
150mm with twin outlet landing	XI) Hotel buildings of 4 star and 5 star grade	Above 15m
150mm with twin outlet landing	XII) All buildings classified under II and III above	Above 25m/35m as applicable
150mm with twin outlet landing	XIII) All buildings classified under IV above	Above 25m and area exceeding 500m^2/floor

150mm with twin outlet landing	XIV) All buildings classified under V above	Above 24m
150mm with twin outlet landing	XV) All buildings classified under VI above	Above 24m but not exceeding 35m
150mm with twin outlet landing	XVI) All buildings classified under VII above	Above 24m but not exceeding 35m
150mm with twin outlet landing	XVII) All storage buildings (H)	Above 10m but not exceeding 24m

As per (IS 3844)

Type of Riser	Internal hydrants form part of any of the following systems
	a) Dry-riser system,
	b) Wet-riser system,
	c) Wet-riser-cum-down-comer system
	d) Down-comer system.
Dry-Riser System (for Cold Region)	Dry-riser main system can be installed in buildings under Group A (iI, ii, ii, iv), where the height of building is above 15 m but not exceeding 24 m up to terrace level and where the water supply for firefighting is immediately available either through the underground water storage tank/tanks or through water mains/town's main
	Dry-riser system does not include hose reel, hose cabinets, fire hose and branch pipes.
Wet-Riser System	Wet-riser system should be provided in the types of buildings according to the provision mentioned. The system should consist of a pipe or number of pipes depending on the area and height of the buildings permanently charged with water under pressure with landing valves, hose reel, hose, branch pipe, etc. at every floor level
	A provision of pressure differential switch to start the pump automatically, so that water under pressure is advisable for operational hydrant, hose reels, etc. as soon as the water is drawn from hydrant landing valves causing drop in pressure. The system also incorporates a stand-by pump to come into operation automatically when the normal power supply source fails.
	The distribution of wet-riser installation in the building should be so situated as not to be farther than 30m from any point in the area covered by the hydrant and at a height of 0.75 m to 1m from the floor. The rising mains should not be more than 50m apart in horizontal.
	Fire service inlet with gate and non-return valve to charge the riser in the event of failure of the static pump directly from the mobile pump of the tie services should be provided on the wet-riser system. The, fire service inlet for 100 mm internal diameter rising main should have collecting head with 2 numbers of 63 mm inlets and for 150 mm rising main, collecting head with 4 numbers of 63 mm inlets should be provided.

	For wet-risers down-comer system, two pumps of different capacities one for the wet-riser and the other for down-comer system should be installed. The pumps should be fed from normal source of power supply and also by an alternative source in case of failure of normal source.
	For a wet-riser system, two automatic pumps should be installed to independently feed the wet riser main, one of which should act as stand-by, each pump being supplied by a different source of power. The pump shall be arranged so that when acting as duty-pump, operate automatically when one or more hydrant is opened thus causing a drop in pressure. The stand-by pump should be arranged to operate automatically in case of failure of the duty pump. The system should have an interlocking arrangement so that only one of the pumps operate at a time.
Wet-Riser-cum-Down-Comer	A wet-riser-cum-down-comer system should be provided in the type of buildings indicated in Table 1 of IS 3844 according to the provision mentioned.
	Priming of the main pump and terrace pump in case of wet-riser-cum-down, or both the pumps in case of wet-riser installation, should be automatic. This can be achieved either by having flooded suction, or by a priming tank with foot valve arrangement. However, a flooded suction is preferable.
Down-Comer System	Single headed landing valve, connected to a 100mm diameter pipe taken from the terrace pump delivery should be provided at each floor/landing, A hose reel conforming to IS 884 : 1985 and directly tapped from the down-comer pipe should also be provided on each floor/landing.

As per (IS 3844)

Riser	The position of risers should be located within lobby approach staircase or within, the staircase enclosure when there is no lobby. However, the risers or the landing valves connected
Landing Valve	Landing valves should be installed on each floor level and on the roof, if accessible, in such a way that control line of landing valve is 1 to 1.2m above the floor level.
Fire Hoses	In buildings with basements, the internal hydrants as well as the hose reel installations should be extended to cover the basement area also, over and above sprinkler system, as necessary.
	Fire hoses should be of sufficient length to, carry water from the nearest source of water supply to the most distant point in the area covered by a hydrant, by the normal route of travel. For each internal hydrant (single headed), there should be a total length of not less than.30m of 63mm conforming to Type A of IS 636 : 1988 or provided in two lengths of not more than 15m each wire wound with coupling together with branch pipe conforming to IS 2871 : 1983
	Such spare hoses also should be in length of not more than 15m complete with coupling. Hoses and accessories should be kept in hose cabinet painted fire red and constructed preferably of wood with glass front

Hose Box	Unless impracticable by structural considerations, the landing valves should always be housed in hose boxes. Such hose boxes should be made of MS plates of 2mm minimum thickness with glass front. The size of the box should be adequate to accommodate single/double headed landing valves with 2 or 4 lengths of fire hose each of 15m length, and one or two branch pipes. The hose reel may or may not be accommodated inside the hose box.
	Building fitted with wet-riser/wet-riser-down-comer mains should, have access roads to within 6m from the boundary line of the building and the nearest wet-riser stack should not be more than 15m from the boundary line of the building.
Hose Reels	In addition to wet-riser systems, first aid hose reels should be installed on all floors of buildings above 15m in height. The hose reel should be directly taken from the wet-riser pipe by means of a 37mm socket and pipe to which the hose reel is to be attached.
	The hose reel should be sited at each floor level, staircase, lobby or mid-landing adjacent to, exits in corridors in such a way that the nozzle of the hose can be taken into every room and within 6m of any part of a room keeping in view the layout and obstructions. The doors provided for the hose reel recesses should be capable of opening to approximately 180". When installation is in open areas, the position should be above head height and the nozzle retainer and the inlet valve should be at about 900mm above floor level.
Air Valve	To allow any trapped air in the rising main to escape when water is pressurized into system, air release valve should be incorporated above the highest outlet of each main.
External Hydrant	For external hydrants, piping (water main) should be laid preferably underground, to avoid it getting damaged by moving vehicles, etc. To avoid rusting, underground pipes should be either of cast iron conforming to IS 1536 in which case it should be properly treated with a coat of primary paint with two coats of bitumen paint. The pipes should be properly supported of pedestals – not more than 3m apart. Underground pipes should be laid 1m below to avoid damage during road repair, etc. and at road crossings where heavy vehicles are expected to pass, it should pass
Jockey Pump	For bigger buildings or major installations, where chance of such leakage is very considerable, it is desirable to install a small pump (using a small motor and 200/300 litre/min pump) with pressure switches for automatic start and stop.
Using Wet-Riser System Pump for Partial Sprinkler System	In main high rise buildings, the basement is used for car parking/housing transformers/or storages and other floors may be used as shopping areas departmental stores, etc. the total area used for such purpose being small, in such cases, the same wet-riser pump may be used for feeding the sprinkler system provided that: a) the total area of the basement to be protected is less than 500 m^2. b) the total area utilized as shops departmental stores is less than 1000 m^2. c) the pump has a capacity of at least 2850 l/min with suitable motor.
AS per IS 15301	
Foundation of Pump	Pumps are to be mounted on a concrete foundation having minimum M grade of reinforced concrete as M15.
	The thickness of the foundation shall be 50mm minimum for small pumps up to 900 litre/min capacity, 75mm for pumps up to 2280 litre/min capacity and 100 litre/min for bigger pumps up to 4500 litre/min. For extra ordinary big pumps, the thickness may go up to 150mm. The size of the foundation shall cover the full length and width of the pump and at least 150mm on the front and back of the pump and 75mm on the sides as clearance.

Pump Room Location	Normally, pump rooms shall be located 6m away from all surrounding buildings and overhead structures
	Where this is not feasible, they may be attached to a building provided a perfect separation wall having 4 hour fire rating is constructed between the pump room and the attached building, the roof of the pump room is of RCC construction atleast 100mm thick and access to the pump room is from the outside. The pump rooms shall normally have brick/concrete walls and noncombustible roof with adequate lighting, ventilation and drainage arrangements.
	Transformer cubicles inside the sub-stations shall be separated from H.T. and L.T. cubicles and from each other by walls of brick/stone/concrete blocks or 355mm thickness or of RCC of 200mm thickness with door openings, if any, therein being protected by single fireproof doors having 2-hour fire resistance
	Transformers installed outdoors, which are supplying power to fire pump shall also be located at least 6m away from all surrounding buildings including sub-station or D.G. House, Where this is not feasible, all door and window openings of the building within 6m of the transformers shall be protected by single fireproof doors and 6 mm thick wired glasses in steel framework respectively.

Requirement of the Fire Safety for Group A – Residential Buildings – Above 15m in height (IS 3844)

Type of Fire Protection Required	**A3- Dormitories, A4- Apartments Houses**				**A5- Hotels**	
Fire Safety	**15 Mts To 35 Mts**	**35 Mts To 45 Mts**	**45 Mts To 60 Mts**	**Above 60 Mts**	**15 Mts To 30 Mts**	**Above 30 Mts and A6 Hotels (Starred)**
Fire Extinguishers	**Minimum 2 per floor Depending upon the Area and Travel Distance**					
Terrace Level Over Head Tank	25,000 litres capacity	5,000 litres (5,000 litres if basement)	10,000 litres capacity	25,000 litres capacity	20,000 litres capacity	20,000 litres capacity
Under Ground Water Tank	Not Required	75,000 litres capacity	75,000 litres capacity	1,00,000 litres capacity	1,50,000 litres capacity	2,00,000 litres capacity
Terrace Fire Pump	900 LPM at Terrace level Tank	Not Required	Not Required	Not Required	Not Required	Not Required
Fire Pump near Under Group Water Tank	Not Required	1 electric pump & 1 Diesel pump of capacity 1620 LPM & Jockey Pump 180 LPM	1 electric pump & 1 Diesel pump of capacity 2280 LPM & Jockey Pump 180 LPM	2 electric pump & 1 Diesel pump of capacity 2280 LPM & Jockey Pump 180 LPM	1 electric pump & 1 Diesel pump of capacity 2280LPM & Jockey Pump 180 LPM	2 electric pump & 1 Diesel pump of capacity 2850 LPM & Jockey Pump 180 LPM

Hose Reel Assembly	Required	Required	Required	Required	Required	Required
Down Comer System	Required	Not Required	Not Required	Not Required	Not Required	Not Required
Wet Riser System	Not Required	Required	Required	Required	Required	Required
Yard Hydrant	Not Required	Not Required	Required	Required	Required	Required
Fire Service Inlet	Required	Required	Required	Required	Required	Required
Manually Operated Fire Alarm Call Point (MCP)	Required	Required	Required	Required	Required	Required
Automatic Detection & Alarm System	Not Required	Not Required	Not Required	Required	Required	Required
Automatic Sprinkler System	Required if area of basement exceeds 200 Sq.mts	Required if area of basement exceeds 200 Sq.mts	Required	Required	Required	Required

Requirements of the Fire Safety for Group B – Educational Buildings of above 15 mts in height (IS 3844)

Type of Fire Protection Required	**B-1 Schools up to Senior Secondary Level** **B-2 All others/training Institutions (Ground + One Storey)**
Fire Extinguishers	Minimum 2 per floor. Depending up on the Area and Travel Distance
Terrace Level Over Head Tank	25000 Litres Capacity
Under Ground Water Tank	Not required
Terrace Fire Pump	900 LPM
Fire Pump near Under Ground Water Tank	Not required
Hose Reel Assembly	Required
Down Comes System	Required
Wet Riser System	Not required
Yard Hydrant	Not required
Fire Service Inlet	Required
Manually Fire Alarm Call Point (MCP)	Required
Automatic Detection and Alarm System	Not required
Automatic Sprinkler System	Required if area of basement exceeds 200 sq.mts

Requirement of the Fire Safety for Group C – Institutional Buildings – Above 15m in height (IS 3844)				
Type of Fire Protection Required	**C1- Hospitals, Sanatoria and Nursing Home**		**C2 – Custodial Institutions C3 – Penal and Mental Institutions**	
Fire Safety (Active Measures)	**15 Mts not exceeding 24 Mts**	**24 Mts not exceeding 30 Mts**	**15 Mts not exceeding 24 Mts**	**24 Mts not exceeding 30 Mts**
Fire Extinguishers	**Minimum 2 per floor Depending upon the Area and Travel Distance**			
Terrace Level Over Head Tank	20,000 litres capacity	20,000 litres capacity	10,000 litres capacity	20,000 litres capacity
Under Ground Water Tank	1,00,000 litres capacity	1,50,000 litres capacity	75,000 litres capacity	1,00,000 litres capacity
Terrace Fire Pump	Not required	Not Required	Not Required	Not Required
Fire Pump near Under Group Water Tank	1 electric pump & 1 Diesel pump of capacity 2280 LPM & Jockey Pump 180 LPM	2 electric pump & 1 Diesel pump of capacity 2280 LPM & Jockey Pump 180 LPM	1 electric pump & 1 Diesel pump of capacity 2280 LPM & Jockey Pump 180 LPM	2 electric pump & 1 Diesel pump of capacity 2280 LPM & Jockey Pump 180 LPM
Hose Reel Assembly	Required	Required	Required	Required
Down Comer System	Not Required	Not Required	Not Required	Not Required
Wet Riser System	Required	Required	Required	Required
Yard Hydrant	Required	Required	Required	Required
Fire Service Inlet	Required	Required	Required	Required
Manually Operated Fire Alarm Call Point (MCP)	Required	Required	Required	Required
Automatic Detection & Alarm System	Required	Required	Required	Required
Automatic Sprinkler System	Required	Required	Required	Required

Requirement of the Fire Safety for Group D – Assembly Buildings Above 15 m in height (IS 3844)				
Type of Fire Protection Required	D1 – Theater over 1000 persons, D2 up to 1000 persons D3 – Permanent Stage over 300 persons		D6 – Not exceeding 30 mtrs	D7 – Elevated or underground for assembly not covered D1-D6
	D4 – up to 300 persons, D5 all others			
Fire Safety	**15 Mts To 24 Mts**	**24 Mts To 30 Mts**	**15 Mts not exceeding**	**24 Mts not exceeding**
Fire Extinguishers	**Minimum 2 per floor Depending upon the Area and Travel Distance**			

Terrace Level Over Head Tank	10,000 litres capacity	20,000 litres capacity	20,000 litres capacity	20,000 litres capacity
Under Ground Water Tank	75,000 litres capacity	1,00,000 litres capacity	1,00,000 litres capacity D1-D5, 2,00,000 litres for D6 Multiplex	1,00,000 litres capacity
Terrace Fire Pump	Not required	Not Required	Not Required	Not Required
Fire Pump near Under Group Water Tank	1 electric pump & 1 Diesel pump of capacity 2280 LPM & Jockey Pump 180 LPM	2 electric pump & 1 Diesel pump of capacity 2280 LPM & Jockey Pump 180 LPM	2 electric pump & 1 Diesel pump of capacity 2850 LPM & Jockey Pump 180 LPM	2 electric pump & 1 Diesel pump of capacity 2850 LPM & Jockey Pump 180 LPM
Hose Reel Assembly	Required	Required	Required	Required
Down Comer System	Not Required	Not Required	Not Required	Not Required
Wet Riser System	Required	Required	Required	Required
Yard Hydrant	Required	Required	Required	Required
Fire Service Inlet	Required	Required	Required	Required
Manually Operated Fire Alarm Call Point (MCP)	Required	Required	Required	Required
Automatic Detection & Alarm System	Required	Required	Required	Required
Automatic Sprinkler System	Required	Required	Required	Required

Requirement of the Fire Safety for Group E – Business Buildings Above 15m in height (IS 3844)

Type of Fire Protection Required	**E1 offices, banks, professional establishments, like offices of architects, engineers, doctors, lawyers and police stations, E2–Laboratories research establishments, libraries and test houses. E3 – Computer installations, E4 – Telephone Exchanges, E5**		
Fire Safety	**15 Mts To 24 Mts**	**24 Mts To 30 Mts**	**Above 30 mt**
Fire Extinguishers	Minimum 2 per floor Depending upon the Area and Travel Distance		
Terrace Level Over Head Tank	10,000 litres capacity	20,000 litres capacity	20,000 litres capacity
Under Ground Water Tank	75,000 litres capacity	1,00,000 litres capacity	2,00,000 litres capacity
Terrace Fire Pump	Not required	Not Required	Not Required
Fire Pump near Under Group Water Tank	1 electric pump & 1 Diesel pump of capacity 2280 LPM & Jockey Pump 180 LPM	2 electric pump & 1 Diesel pump of capacity 2280 LPM & Jockey Pump 180 LPM	2 electric pump & 1 Diesel pump of capacity 2850 LPM & Jockey Pump 180 LPM

Hose Reel Assembly	Required	Required	Required
Down Comer System	Not Required	Not Required	Not Required
Wet Riser System	Required	Required	Required
Yard Hydrant	Required	Required	Required
Fire Service Inlet	Required	Required	Required
Manually Operated Fire Alarm Call Point (MCP)	Required	Required	Required
Automatic Detection & Alarm System	Required	Required	Required
Automatic Sprinkler System	Required	Required	Required

Requirement of the Fire Safety for Group F Mercantile Building Above 15 m in height (IS 3844)

Type of Fire Protection Required	**F1 – Shops, Stores up to 500 Sq.m, F2 – Shops, Stores more than 500 Sq. mtrs.**		**F3 – Underground shopping centre and Storage**
Fire Safety (Active Measures)	**15 Mts To 24 Mts**	**24 Mts To 30 Mts**	
Fire Extinguishers	**Minimum 2 per floor Depending upon the Area and Travel Distance**		
Terrace Level Over Head Tank	10,000 litres capacity	10,000 litres capacity	10,000 litres capacity
Under Ground Water Tank	1,00,000 litres capacity	1,50,000 litres capacity	1,50,000 litres capacity
Terrace Fire Pump	Not required	Not Required	Not Required
Fire Pump near Under Group Water Tank	1 electric pump & 1 Diesel pump of capacity 2280 LPM & Jockey Pump 180 LPM	2 electric pump & 1 Diesel pump of capacity 2280 LPM & Jockey Pump 180 LPM	2 electric pump & 1 Diesel pump of capacity 2280 LPM & Jockey Pump 180 LPM
Hose Reel Assembly	Required	Required	Required
Down Comer System	Not Required	Not Required	Not Required
Wet Riser System	Required	Required	Required
Yard Hydrant	Required	Required	Required
Fire Service Inlet	Required	Required	Required
Manually Fire Call Point (MCP)	Required	Required	Required
Automatic Detection & Alarm System	Required	Required	Required
Automatic Sprinkler System	Required	Required	Required

Requirement of the Fire Safety for Group G Industrial Buildings Above 15m in height not to be permitted 18 Mts in height

Type of Fire Protection	G1 – Low Hazard Industries			G2 – Moderate Hazard Industries		
	BUILT UP AREA					
Fire Safety	**Up to 100 Sq.mt**	**More than 100 Sq.mt. and up to 500 Sq.mtrs**	**More than 500 Sq.mtrs**	**Up to 100 Sq.mtrs**	**More than 100 Sq.mtrs and up to 500 Sq.mtrs**	**More than 500 Sq.mtrs and up to 1000 Sq.mtrs**
Fire Extinguishers	**Minimum 2 per floor Depending upon the Area and Travel Distance**					
Terrace Level Over Head Tank	5000 litres in case of basement area exceeds 200m^2	5000 litres add 5000 litres if the provision of sprinkler in basement	10,000 litres capacity	10,000 Litres capacity	10,000 Litres capacity	20,000 Litres capacity
Under Ground Water Tank	Not required	Not required	1,00,000 litres	Not required	Not required	75,000 Litres capacity
Terrace Fire Pump	450 LPM	450 LPM	450 LPM	900 LPM	900 LPM	900 LPM
Fire Pump near Under Group Water Tank	Not required	Not required	1 electric pump & 1 Diesel pump of capacity 2280 LPM & Jockey Pump 180 LPM	Not required	Not required	1 electric pump & 1 Diesel pump of capacity 2280 LPM & Jockey Pump 180 LPM
Hose Reel Assembly	Not required	Required	Required	Required	Required	Required
Down Comer System	Not required	Required	Required	Not required	Not required	Required
Wet Riser System	Not required	Not required	Required	Not Required	Not Required	Required
Yard Hydrant	Not required	Not required	Required	Not Required	Not Required	Required
Fire Service Inlet	Not required	Not required	Required	Not Required	Not Required	Required
Manually Operated Fire Alarm Call Point (MCP)	Not required	Not required	Not Required	Not Required	Not Required	Required
Automatic Detection & Alarm System	Not required	Not required	Required	Not Required	Not Required	Required
Automatic Sprinkler System	Required (if there is basement)	Required (if there is basement)	Required	Required	Required	Required

Courtesy: Jignesh.parmar

ENERGY, ELECTRICAL ENERGY AND RENEWABLE ENERGY – 28

The articles on this series on Electrical Energy and Renewable Energy will continue from the concept of 'Waste to Energy' and Rooftop Solar and Solar Thermal Technologies and so on and this article, being the first in the new decade, is devoted to the review of the role of Energy in the development process of the country with the present scenario, challenges and projections.

Energy Scenario, Challenges and Projections

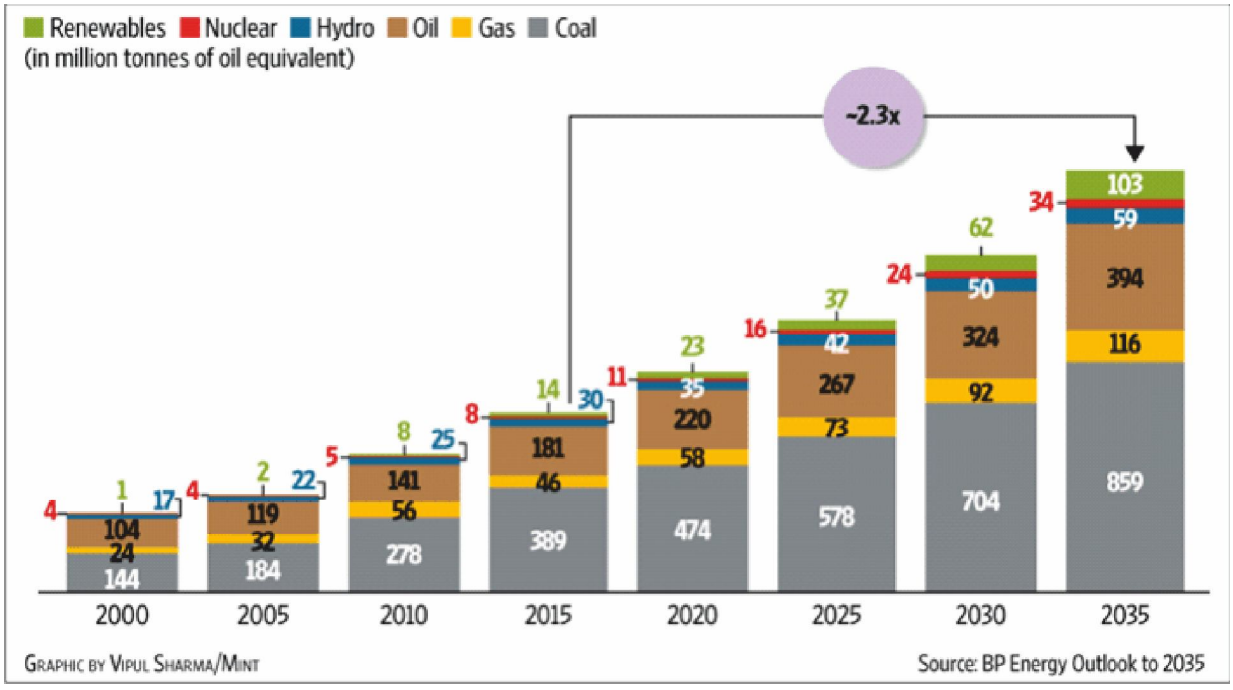
(Extracts from an article on the theme)

India is firmly set on a path of economic growth that is estimated to usher in prosperity like never before. This economic prosperity will need to be built on the back of significant transformations across several facilitating elements, the primary ones being infrastructure build-out, energy availability and sustainability. India's per capita energy consumption currently is almost one-third the global average, and trails far behind the mean figure for the developed world. Our energy consumption is largely based on coal, along with a preponderant dependence on other fossil fuels. Although per capita energy consumption has more than doubled over the past 15 years, almost 240 million people do not have access to affordable energy supply today. Our PM has recently inaugurated a Scheme to address this on priority.

Energy consumption in India has grown at a compound annual growth rate of about 6% during the last decade. *BP Energy Outlook 2035* expects India to achieve the fastest energy consumption growth among all major economies, despite rapid increases in non-fossil fuel production. The total energy consumption is expected to grow by 128% by 2035. Demand for gas is expected to expand by 155%, followed by coal (121%) and oil (118%), while demand for renewables, nuclear and hydro are estimated to rise by 656%, 334%, and 99%, respectively (*see chart*). Our potential clearly positions us as the leading global driver of growth in energy consumption in the next 20 years, possibly surpassing China in the process. Even under the most sombre growth scenarios, it is fully expected that India's growth ambitions will lead to a 100% increase in energy consumption, thereby requiring double the existing energy sources.

RISING NEED

Primary energy demand is expected to increase by 2.3 times over the next 20 years.



On the supply side, India is significantly dependent on coal as a primary fuel, which accounts for 58% of the energy consumption in the country. It is estimated that we have one of the largest resource bases of coal, with the policies and gains of the past few years positioning us strongly for the future. It is expected that India will be the largest consumer of coal, equivalent to over 435 million tonnes of oil by 2035. According to current estimates with respect to oil and gas, India is home to only 0.3% of the world's sedimentary basins. Further, we account for a mere 0.3% of the global oil and 0.8% of the global gas reserves. We are, however, blessed with abundant natural resources in the form of sun and wind. The total wind potential in the country is estimated to be over 30 times the current installed capacity of 27 gigawatts (GW), while our solar potential is expected to grow by about 90 times the current installed capacity of 8GW. Already, the government has an aggressive target of 60GW of wind capacity and 100GW of solar capacity by 2022.

Believing in India's solar mission takes a leap of faith

Successive governments have embarked on addressing the forthcoming challenge at varying intensities and levels of aggressiveness. There are, however, some structural issues that affect the sector. Firstly, we have successively underpriced our resources, making the economics of the sector unattractive to a large number of serious investors. The energy subsidies over the years have been a major burden to the economy. The total subsidy for 2014-2015 was Rs76,285 crore. The diesel price deregulation and direct benefit transfer of liquefied petroleum gas subsidy coupled with low oil prices, led to a 64% drop in the subsidy burden for 2015-2016, which now stands at Rs27,571 crore. Gas prices in the country have also been fixed by the government based on different regional benchmarks. Domestic prices were reduced by over 50% from $5.1 per million British thermal units (mmBtu) in November 2014 to $2.5 per mmBtu for the period between October and December 2016, making the sector unviable for producers, even though the country is in a supply deficit.

Given this scenario, the newly announced pricing regime that promises market prices for natural gas produced from forthcoming fields is a favourable step to attract investment in the sector. While the government has provided support to several segments of our policy at different points in time, the mechanism of delivering such support has been inefficient.

Secondly, past events in the policy and governance ecosystem have created the impression of a less-than-desirable regime of instability and lack of administrative efficiency.

Thirdly, the relative naivety of infrastructure financing in the early years resulted in increased corporate leverage, without commensurate assets to underpin the debt levels, thus putting pressure on stakeholders, including financial institutions.

These three factors, coupled with inefficient underlying processes and systems, have reduced the attractiveness of the sector to investors, whose participation is crucial for us to fulfil our 2035 aspirations.

Our current path of growth and evolutionary reforms is likely to widen the gap between the supply and demand of energy, and has potential to cripple any "aggressive" growth plans. If no significant changes are made to the current trajectory, India might increase the burden on the fiscal front associated with energy independence and sustainability. We will then need to import significantly larger quantities of primary resources to fulfil our growth ambitions. BP expects India's energy production as a share of consumption to decline from 57% in 2014 to 54% by 2035, and imports to rise by 153%. The country's oil imports are expected to increase by 161%. This will account for 52% of the increase in imports, followed in volumetric terms by increases in coal imports by over 122%, and gas by over 301%.

A time of change for the oil industry

The future of India and its economic growth plans are critically linked to the fortunes of the energy sector.

To propel this key primary sector to the next level, we need a combination of bold and aggressive moves, and a "clean up" to bring in more efficiency and effectiveness. The moves need to be comprehensive and coordinated.

They must be focused on all aspects of managing the demand side, while fomenting the supply side, ensuring that critical enablers are in place, and firing on all cylinders. Given our requirements, the Indian energy landscape will continue to be a combination of fossil and new energy based solutions over the next 20 years. It will be important to get the balance right.

The key question is, "is it time to get even bolder on renewables"? The present government has certainly made huge strides in achieving our renewables aspirations. Can we be the country that sets the course for a new development model for the energy sector? Can we blaze a new trial by learning from the mistakes of the more developed countries with regards to renewables? Is it possible for us to create a new paradigm for sustainable and viable development of the sector as the core to energy independence? All these would imply significant public and private investments in developing cost-effective technologies for the generation, storage and distribution of energy.

So the main concern here is, "is it better to channel government money earmarked for resource segments toward bets on the future of renewables"? Significant innovation, both in terms of technologies and business models, will have to be made to turn the entire value chain into an attractive proposition. The key is to accelerate the process of building scale, experience, talent and knowledge, in order to help us advance the large-scale viability of the sector by many years.

Secondly, commodity cycles normally go through high and lows. Currently, we are in one such trough. Is it time to make some aggressive moves that secure our fossil-related resources? The prolonged run of lower oil prices afforded the government an opportunity to create an investment fund to help Indian oil and gas companies bolster domestic as well as overseas investments. While some companies are actively seeking overseas opportunities by leveraging their own financials, we seem to have missed the opportunity for setting up a sovereign oil fund. The basis of this one-time infusion of funds to secure everything from resources to strategic reserves is paramount to our future energy independence. The often-mentioned challenge of "how would we administer such a fund?" is, at best, rhetorical. Our inability to find answers to such administration challenges has laid many a good idea to an early rest.

Thirdly, we must consider complementing our initiatives for supply augmentation with measures that help increase our efficiency in managing demand. These initiatives also need to be supported by policies and regulations like time-of-day pricing, incentives and so on, along with large-scale investment in efficiency boosting technologies across the value chain.

Finally, there is a need to rationalize the energy governance software infrastructure. The existing resource-focused governance structure (coal, oil and gas, renewables, etc.) should give way to a more integrated and comprehensive mechanism. Such a mechanism must help us understand the complex trade-offs, and allocate both human and financial resources with energy independence in mind, rather than just the "oil versus gas versus coal versus renewables" paradigm. The audit and licensing mindset must be replaced with effective measures to drive flexible administrative mechanisms that are more facilitative and supportive.

In conclusion, the future of the economic growth of India is dependent on our ability to leverage energy sources to fuel our ambitions for the sector. In his book, *The Audacity of Hope*, Barack Obama, states, "A nation that can't control its energy sources can't control its future." Securing our energy future is thus critical for India to become a superpower in the future.

(To be continued)

S. Mahadevan, B.E., F.I.E., M.B.A.,
Consultant, Energy and Energy Efficiency,
Mobile: 98401 55209

Over every mountain there is a path, although it may not be seen from the valley.
– THEODORE ROETHKE

RINGLET

~ DIRECT CHANNEL PARTNER of :hager

Distribution boards

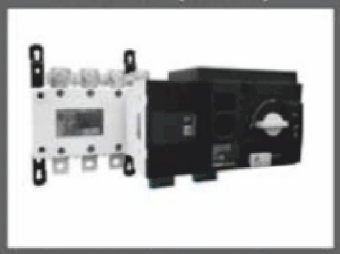
Miniature Circuit Breakers (MCB)

Moulded Case Circuit Breakers (MCCB)

Residual Current Circuit Breakers (RCCB)

RCBO ,RCD+MCB modules

Manual Changeover Switches



Automatic Transfer Switches

Time Switches

Digital Energy Meters

Contactors

Isolating Switches

Surge Protection Devices

LED Indicators

Plug & Socket Outlets

RINGLET

Door No. 3A Plot, No: 60 1st Floor,
15th Street, Tansi Nagar,
Velachery, Chennai - 600 042.
Tel : +91 44 22432543 Mobile : +91 98407 19032
Email : epowerengineering @ gmail.com / epowerengg2013 @ gmail.com
Web : www.epowerengineering.in

:hager

SAALUMARADA THIMMAKKA – THE GREEN CRUSADER

106-year-old environmentalist Saalumarada Thimmakka has made herself and India proud to such an extent that even the BBC (British Broadcasting Corporation) knows her. The reason for her fame is that she has planted over 8,000 trees in 80 years. She has earned herself a spot in the prestigious list of BBCs 100 most influential women.

She is the oldest woman on the list for planning the 8,000 trees to fill the void that had been left after she realized she could not bear children. She has also won the prestigious Padma Shri.

Saalumarada Thimmakka

How it all begun?

Born in a poor family of Hulikal village in Magadi Taluk, Ramnagar, Karnataka, she never had the opportunity to go to school or have any kind of formal education. She was known by the name of Thimmaka during her childhood. She started working at an early age as a quarry labourer.

In 1928 she was married to Bikkala Chikkayya who was a labourer himself. After several years of marriage when the couple could not have any children, to fill the emptiness in their life the couple decide to plant banyan trees and raise them as their kids. This is when it all started.

In 1948, Thimmakka along with her husband made up their mind to plant trees from their village in Hulikal to Kudoor. Thimmakka and her husband thus commenced a journey of pure dedication, untiring, and unselfish love of planting trees and nourishing them till they bore fruit.

From Thimmakka to Saalumarada Thimmakka

Thimmaka and her husband decided to plant trees from their village to the next village, Kudoor. The choose a stretch of 4 km and there were no trees at all in the locality. Since there were plenty of banyan trees near her village the couple decided to plant the trees along the roadside.

They planted 10 young banyan plants in the first year and increased the number to 15 in the second and 20 the year after. The couple not only planted them but tended them to maturity while protecting them from herbivorous animals by fencing around them with thorny bushes.

Every morning after finishing their regular work the couple watered the plants as a part of their daily routine and when they used to run out of the water, they used to fetch it from nearby ponds and wells. They use to cover the whole stretch on their feet watering the plant while returning on their way back home.

They plant the young saplings during the monsoon season so that they could have adequate water for their growth. The couple went to the hardship out of sheer passion for helping the environment and humanity. This never changed their financial status but they never lamented on their poverty nor flaunted about their work.

An undying passion

Thimmakka's husband passed away in 1991 but that did not discourage her in any way. She pursued her mission with the same determination and courage. In spite of the fact that heavy rain had washed away her

house that year, she with the help of well-wishers managed to rebuild the mud house and applied for a widow pension of merely 75 rupees at that time.

In Kannada language rows of trees are known as Saalumarada. It was then that Thimmakka was given the name Saalumarada Thimmakka. It was given to respect her work towards planting the trees and saving the environment, and the hardship the couple faced during the process. The management of the trees these days is taken care of by the Government of Karnataka.

Additional community services by Thimmakka

She has done much more than planting trees. She is actively involved in the state and national environmental protection campaign.

Thimmakka also is involved in many other social activities. This includes building a rainwater storage tank for the annual function of her village. She has set up a trust for building up a hospital in her village.

Saalumarada has been an active campaigner in circulating the message of afforestation. She believes every human being on earth should plant trees. She still faces a life of financial struggle. However, this never deterred her spirit from helping mankind.

Accreditations and Citations of Saalumarada Thimmakka

Saalumarada Thimmaka has been a role model for environmentalist all over the world. In 2016, BBC included her in their list of top 100 influential and inspiring women. She is a great example who showed the world how uneducated women can make a big difference to the betterment of society. She achieved all these with sheer passion and undaunted hard work

Padma Shri Award

"At the Padma awards ceremony, it is the President's privilege to honour India's best and most deserving. But today I was deeply touched when Saalumarada Thimmakka, an environmentalist from Karnataka, and at 107 the oldest Padma awardee this year, thought it fit to bless me." - President of India

Thimmaka was awarded Padma Shri, the fourth highest civilian award in the country in 2019. it is at the age of 106 that the mother of trees got the award. However, she receiving the award will be fondly remembered for a protocol violation which the President of India, Ram Nath Kovind considers as a touching moment.

In addition to Padma Shri, Saalumarada Thimmakka is honoured with many awards for her unwavering efforts towards protecting the environment. She has bestowed with titles like Vanamitra, Nisargaratna, Vrikshapremi and Vrikshasri. Below is a list few such awards:

- Padma Shri
- National Citizen Award by Government of India
- Gait Free Brabiency National award
- National Indira Priyadarshini Vrikshamitra Award by Government of India
- Karnataka Rajyothsava Puraskar
- The NADOJA award, Hampi University in
- INDIRA RATNA Puraskar
- Karnataka Rajya Parisara Award
- Women Empowerment Award
- The GREEN MOTHER Award
- PARISARA PRIYADARSHINI Puraskar
- Mother of Tree Award
- Jagajyothi Basavanna Puraskar
- Dr B. R. Ambedkar State Award
- Green India Puraskar
- Sahara India Puraskar
- Padma Shri in 2019

Saalumarada Thimmakka at the age of 106 lives with her foster son Umesh. She is an inspiration to every woman the society labeled as barren. The green crusader bestowed society and mankind with hard work, patience, and undying love for the environment.

HUMOUR

A government that robs Peter to pay Paul can always depend on the support of Paul.

A fool's brain digests philosophy into folly, science into superstition, and art into pedantry. Hence University education.

Both optimists and pessimists contribute to society. The optimist invents the aeroplane, the pessimist the parachute.

No man ever believes that the Bible means what it says: he is always convinced that it says what he means.

Why, except as a means of livelihood, a man should desire to act on the stage when he has the whole world to act in, is not clear to me.

The only time my education was interrupted was when I was in school.

Patriotism is your conviction that this country is superior to all others because you were born in it.

– GEORGE BERNARD SHAW

தமிழ்நாடு அரசு

மக்கள் நல்வாழ்வு மற்றும் குடும்பநலத்துறை

இந்திய மருத்துவம் மற்றும் ஹோமியோபதி ஆணையரகம்

நிலவேம்பு குடிநீர்

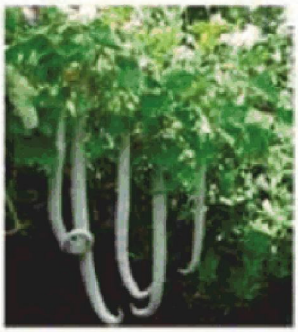
இவற்றில் சேரும் மருந்துகள்

நிலவேம்பு

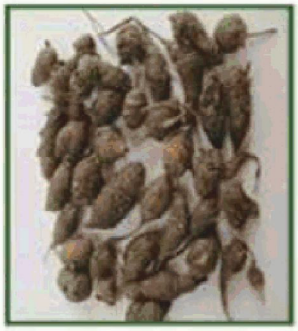
வெட்டிவேர்

விலாமிச்சம்வேர்

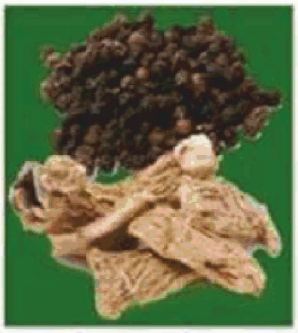
சந்தனம்



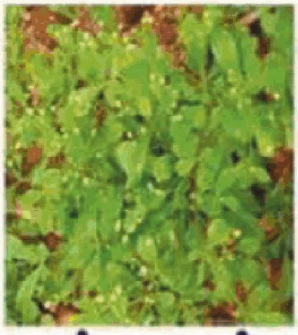
பேய்ப்புடல்



கோரைக்கிழங்கு



சுக்கு,மிளகு



பற்பாடகம்

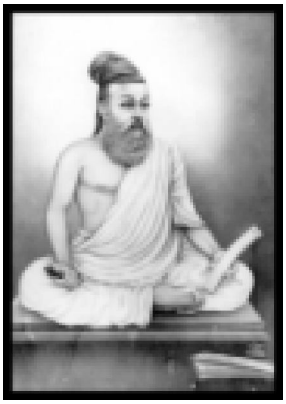
குடிநீர் அளவு

5 வயது முதல் 12 வயது வரை உள்ள குழந்தைகளுக்கு 10 மி.லி. தினமும் 2 வேளை அருந்தவும்.

பெரியவர்களுக்கு 50மி.லி. தினமும் 2 வேளை அருந்தவும்.

எல்லா வகை காய்ச்சலும் குணமாகும்

TIRUKKURAL AND FAIR AND ETHICAL MANAGEMENT - 12



Further to what was seen in part 11, Valluvar establishes that it is the ability of people to show basic courtesy and receive persons of differing points of view with open arms that can ensure a fair and open discussions for progress. Tiruvalluvar brings out some valuable points about how these qualities can be achieved as illustrated in the following Kurals.

In the first Kural referred, which sounds very relevant to the present scenario of diversities of all kinds, Tiruvalluvar establishes the importance of courtesy and how it can help. The second Kural referred establishes how these important qualities can be developed.

Uruppoththal Makkaloppu Andraal;
Veruththakka
Panpoththal Oppatham Oppu ***Kural 993***

உறுப்பொத்தல் மக்களொப்பு அன்றால்
வெறுத்தக்க
பண்பொத்தல் ஒப்பதாம் ஒப்பு. *குறள் 993*

"It is not similarity of external marks that bind men together: it is uniformity of courteous behaviour that can weld them into a single body"

Anbudaimai Aandra Kudipiraththal Ivvirandum
Panbudaimai Ennum Vazhakku ***Kural 992***

அன்புடைமை ஆன்ற குடிப்பிறத்தல்
இவ்விரண்டும்
பண்புடைமை என்னும் வழக்கு. *குறள் 992*

"Humanity and Good Breeding develop into the noble virtue of Courteousness"

HOME FESTIVALS - 2

மாசி - Masi (February/March)

Above, this is the month of **Mahasivaratri**, *Siva's great night*. In the above painting four stories associated with the festival are told. At lower left a hunter has been cornered in a tree-top by wild beasts, where he must spend the night. To avoid sleep he plucks leaves from the bilva tree, sacred to Lord Siva, and drops them upon a sivalinga below-a traditional for of worship. Many undertake fasts and stay awake the whole night, praying to Lord Siva both at home and in temples (lower right).

The home observance of Karadainombu (upper right) derives from the story of Savitri and her husband, Satyavan. They enter a forest, where he dies. When Lord Yama, the God of Death, comes to take his life, Savithri persuades Yama to let him live. The intent of the observance is that wives not be separated from their husbands.

Another explanation of this festival (upper left) is that on this day Lord Siva tied a thread to parvati's right hand after their marriage as a sign of protection and fidelity.

(To be continued)

Look deep into nature, and then you will understand everything better.
– ALBERT EINSTEIN

ENERGY CONSERVATION DAY CELEBRATION
on 14.12.2019 at MADURAI


GRAVITY


ENGINEERS' ASSOCIATION 'A' GRADE

EXECUTIVE MEETING ON 14.12.2019 HELD AT MADURAI

Printed and Published by 'Tamilnadu Electrical Installation Engineers' Association
"A" Grade, Chennai -16. Editor : S.K. Pandian Advisor : S. Mahadevan