

## Cooking and Lighting Technology Mission (CALTEM)

A note prepared by  
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### 1. INTRODUCTION:

- a) It is a matter of concern for all of us that even after 55 years of independence there are 63% of rural households in India which use only kerosine for lighting. Majority of the kerosine lamps are hurricane type lamps, which produce very poor light of about 60-70 lumens (lm) (a 100 W bulb produces ~ 1300 lm and for reading about 100-200 lm/m<sup>2</sup> (lux) is sufficient). In some states like Bihar, Assam etc. about 90-95% rural households use only kerosine for lighting. Thus there are estimates that 90-100 million rural households do not have electricity and with frequent blackouts and brownouts even larger number probably use kerosine for lighting. Similarly, rural areas in India use about 180 million tons of biomass fuel for cooking through very inefficient and smoky cookstoves. Cooking and lighting energy constitute 75% of total energy used in rural areas. Yet the quality of end product (heat and light) leaves much to be desired and the rural poor are still living in stone ages. Our mass media rarely highlight this plight of rural poor who have the same aspirations as the rest of the country of getting clean fuel like liquid petroleum gas (LPG) for cooking and good high lumen light source. With electricity shortfall of about 15,000 MW/year in India; poor grid infrastructure in rural areas and ever increasing petroleum imports for the country it is safe to say that the lives of rural poor will remain in a primitive state for a long time to come. The major reason for this sorry state of affairs is the unavailability of technology to take care of lighting and cooking needs of rural population. There is therefore a need to develop technologies and fuel systems which are based on locally available resources and are also affordable.
- b) A recent paper (published in Current Science) produced by NARI has shown that with the use of high technology from the emerging areas of nanotechnology and biotechnology it

is possible to produce devices for generation of cooking and lighting energy by an efficient use of the locally available raw materials.

- c) It is therefore envisaged that the cooking and lighting in future will be based on liquid and gaseous fuels obtained from locally available biomass sources. Thus production of ethanol, biodiesel and pyrolysis oil will form the backbone of cooking and lighting technology. Similarly supply of biogas from extremely efficient biogas digesters together with efficient storage system will be the basis of clean cooking energy. The details are again given in the enclosed paper.
- d) According to the preliminary calculations (details are given in the paper) this mission will have the capability of creating Rs. 30-40,000 crores/yr industry in terms of liquid fuel supply and end products for cooking and lighting. The implications of this for creating rural wealth are tremendous. Prosperous rural areas will help the country with its sustainable development and this augers well for its stability and security.

## 2. WHAT NEEDS TO BE DONE:

- a) A technology mission for cooking and lighting (CALTEM) should be set up on the lines of existing technology missions for other areas. The mandate of this technology mission should be to bring adequate light (~ 100-200 lux) and user friendly and clean cooking system, backed by fuel supply chain to every rural household by 2015.
- b) In order to **fulfill this mandate** the mission will do the following :
  - i) To fund projects for developing cooking and lighting technologies and appropriate fuel supply systems for rural areas.
  - ii) To facilitate availability of funds to entrepreneurs for commercialization of these technologies.
- c) The mission could be housed either in the office of PSA or in any nodal ministries like DST, MNES, etc. and will have a core group to advise it. The core group will consist of govt. officials from DST and CSIR and the ministries of Rural Development, Environment, Power, Non-conventional Energy Sources etc. Besides it should also have representatives of a few NGOs and captains of industries which are involved in rural development (e.g. Hindustan Lever, Mahindra and Mahindra, Birla Group, ITC etc.). This group which will be a mixture of representatives of Govt., NGOs and corporate sector will have a better chance of getting the technologies to rural areas rapidly than a purely government venture.

- d) CALTEM should also encompass the Rural Electricity Supply Technology (REST) mission that the Prime Minister has recently started and which is being managed by the Ministry of Power. The mandate of REST mission is to supply electricity to all rural areas by 2012 A.D. Most of the electricity will go in providing lighting to these areas.
- e) CALTEM should try to bring under one umbrella all the various programs on cooking and lighting scattered under different ministries. It is suggested that the funds given for cooking and lighting energy in different ministries should all be clubbed together and be made available to this technology mission.

3. **DURATION OF THE MISSION:** The CALTEM will operate in two phases of 5 years each. After evaluation of its performance for first 5 years the funding for next 5 years' will be established.

#### 4. **METHODOLOGY:**

- a) The CALTEM will have a small secretariat of 4-5 member staff and will be housed in PSA's office. It will be headed by an expert rural energy technologist, called coordinator of the mission and who should preferably be a non-government official so that the continuity and stability is maintained.
- b) CALTEM will finance the following technologies for development (This list can be expanded if the need arises) :
  1. Sturdier and more efficient thermo-luminescent mantle development for lanterns.
  2. Efficient multifuel lanterns.
  3. Efficient and cheap thermoelectric elements development.
  4. Efficient permanent magnet DC generators and motors.
  5. Pyrolysis oil development.
  6. Breeding of better varieties for producing biodiesel from shrubs and perennial crops.
  7. Thermal depolymerization of wet biomass and animal waste into light crude oil.
  8. Absorbent materials for biogas so that it can be stored in small cylinders at < 15-20 atmospheres pressure.
  9. Efficient biogas digesters running on multiple fuel inputs.
  10. Development of efficient, affordable cook stoves running on ethanol, pyrolysis oil and other green liquid fuels.
  11. Development of efficient and affordable chemiluminescence device for household lighting.

12. Development of high efficiency ultra capacitors as substitute for batteries.

13. Biomass based 10-500 KW<sub>e</sub> power-generating units.

- c) CALTEM secretariat will help the entrepreneurs in accessing soft loans for setting up manufacturing of technologies and fuel systems. This activity might start in phase I (first 5 years of CALTEM) and will gain momentum in phase II (next 5 years).

#### 5. **TENTATIVE BUDGET (For 5 years):**

- a) There are presently 13 projects outlined above. However some more projects will be added to the list. Each of these projects might be done in couple of labs around the country. Hence a tentative budget of Rs. 1 crores should be earmarked for each project. Some projects might use less and others might use more money hence an average of Rs. 1 crores/project is sufficient to start with. Hence total budget for projects will be Rs. 13 crores for 1st 5 years.
- b) The budget for core staff (4-5 people) plus some office equipment and stationery together with travel and other expenses of staff and CALTEM coordinator will be about 4 crores (for 5 years). This will include hiring of consultants for project evaluation, meetings etc. **The coordinator will not draw any salary.**

**Thus total budget for CALTEM for first 5 years will be Rs. 17 crores.**

As can be seen from this small note, CALTEM has the potential of touching almost all aspects of rural life. Hence there is a potential of producing overall rural development by this program. It is also quite possible that CALTEM may provide an impetus for scientific community to do excellent R & D for India's development. It is hoped that this can be the beginning of a major effort of bringing light and hope to the lives of rural poor.