Note: Figures are not available

# PRESENTATION TO ENVIRONMENTAL GRANTMAKERS ASSOCIATION

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*Message # 1: If you care about the environment, you must care about the production and utilization of energy in society, because a major threat to the environment is from energy-related activities.*

On a global scale, the growth in the atmospheric concentration of carbon over the past century (Figure 1) shows clearly that human activities, particularly, energy production, have been responsible for the degradation of the global atmosphere. The source-wise breakup of annual net carbon emissions indicates (Figure 2) that x% of these emissions are from power production, y% from the combustion of transport fuels, etc.

One of the important regional problems is acid rain which is an issue affecting the USA and Canada, Britain and Scandinavia, Eastern and Western Europe. The main source of the acid rain is the combustion of sulphurous coals in power plants. (Table 1).

And of course one of the most important urban environment problems arises from vehicular pollution arising from transport pattern. (Table 2 -- Urban Pollution levels in some Third World cities)

*Message # 2: If you care about the environment being sustainable over the long term, you must care about how energy is produced, in particular whether from non-renewable or renewable sources.*

The background of this concern is the fact that different periods of human history have been dominated by different primary sources of energy. These changes can be illustrated in various ways for instance as shown in Figure 3. What is interesting is that until the mid-nineteenth century, biomass in the form of renewable fuelwood, was the main source of inanimate energy. This source was used renewably, but with growing demand, its consumption shifted rapidly to the depletable or non-renewable mode. This decline in the dominance of fuelwood coincided with the growth in the availability and use of coal. And then came the rise of petroleum and natural gas.

Interestingly enough, the shape of the consumption curves strongly resemble the replacement of old technologies with new technologies (Figure 4).

Coal and petroleum are still dominant but the carbon emissions from their combustion has raised the spectre of global warming. Consequently, even if fossil fuel resources are inexhaustible -- which they are not -- limits have to be imposed on their use in order to mitigate, if not avert, the disastrous consequences of global warming. Hence, all the international concern over climate change.

Fortunately, it is precisely at this juncture that the new renewable sources are growing rapidly -- solar (thermal and photovoltaic), wind, ocean energy, geothermal, biomass, biogas, ethanol, methanol, and hydrogen. The most important feature of this rise of renewables is that they do not represent a return to traditional ways of using many of these renewable resources; the rise is based on the use of the sources through new fuels, new technologies and new devices (Table 3). Indeed, what we are talking about is **new energy**.

A major reason for this growth of **new energy** is, firstly, the decline in costs due to R & D and organizational learning (Figures 5 and 6), and secondly, innovative ways of financing these emerging technologies -- **new money**.

*Message # 3: If you care about people, particularly the poor, you must care -- not merely about energy supplies and consumption -- but about the **services** that energy provides people and the human needs that it satisfies, i.e., you must care about how energy is used.*

The shift in focus from energy supplies and consumption to energy services is not a semantic twist, a mere play of words. It represents a profound change in the way of thinking about energy, in fact, in the paradigm for energy.

In the old paradigm, the magnitude of energy consumption is deemed to be the indicator of development and the measure of the quality of life.

In the new paradigm for energy, it is recognized that what human beings and their individual and collective activities require is not energy *per se* but the work that energy performs and the services that energy provides: illumination, warmth, "coolth" (to coin a word), mobility, etc. In this approach, development requires a substantial increase of energy services (particularly for the poor).

[SCR: GIVE THE PURA EXAMPLE HERE TO SHOW HOW DRAMATICALLY THE QUALITY OF LIFE CAN IMPROVE BY IMPROVING ENERGY SERVICES]

*Message # 4: If you care about energy services, you must care, not merely about increasing energy supplies and consumption,*

*but also about improving the efficiency with which energy is utilized because "energy saved is equivalent to energy produced".*

Development, and improvement of the quality of life, require a substantial increase of energy services (particularly for the poor). Such increases can be achieved not only by increasing the supply of energy to the devices (lamps, heaters, air conditioners, vehicles, appliances, etc) but also by increasing the efficiency with which these devices provide energy services and/or shifting to more efficient energy carriers.

Consider, for example, the shift from kerosene wick lamps to 20 W fluorescent tubelights in Pura village. This shift led to increases in the lumens, energy and efficiency as shown below.

| | KEROSENE WICK LAMP | 20 W TUBE-LIGHT |
|---|---|---|
| LUMENS RATIO | 1 | 18.67 |
| ENERGY RATIO | 1 | 0.07 |
| COST RATIO | 1 | 0.50 |
| EFFICIENCY RATIO | 1 | 420.00 |

The following conclusions may be drawn from the information in the table:

- The switch in Pura Village from kerosene wick lamps to 20 W Fluorescent Tubelights has resulted in the **illumination increasing by a factor of about 19** despite the fact that the **consumption of energy has decreased to only one-ninth the initial value** (with kerosene). This dramatic achievement is the result of the **420 times greater efficiency of 20 W fluorescent tubelights compared to kerosene wick lamps**.

- On the one hand, a Pura household used to consume (in its kerosene days) as much energy for lighting as a nine-room household with each room lighted with a 20 W fluorescent tubelight. On the other hand, each room of the fluorescent-tubelight-illuminated household enjoyed as much illumination as nineteen kerosene-lighted households. Thus, before the switch from kerosene wick lamps to 20 W fluorescent tubelights, households in Pura used to **consume far more energy but enjoy far less lighting energy service** than households using fluorescent tubelights.

- If better illumination (or lighting energy service) can be taken as an improvement in the quality of life, and if improvement in the quality of life is a

crucial aspect of development, then the switch in Pura Village from kerosene wick lamps to 20 W fluorescent tubelights represents an advance in the process of development. However, this advance in the process of development has been achieved along with a *decrease* in the consumption of energy. Hence, **it is the level of energy services -- and not the magnitude of energy consumption -- which must be taken as the indicator of development**.

*Message # 5: If you care about promoting the efficient production and use of energy for sustainable development, you must as a body emphasize not only INFORMATION and TRAINING, but also ANALYSIS leading to ADVOCACY and ACTION (INTAAACT).*

**A Case Study of Cogeneration of Surplus Electricity in Indian Sugar Factories:** Even though India is the largest producer of canesugar in the world and all sugar factories use bagasse as fuel for their boilers, almost all the approximately 450 Indian sugar mills have low pressure boilers that do not permit the cogeneration of surplus electricity. By installing high pressure boilers, India can realize an enormous potential of about 3000 MW.

To initiate the process of realizing this untapped potential, the Director of Sugar in Karnataka State was requested to conduct a preliminary meeting of sugar factories in September 1992 to discuss cogeneration. This *ADVOCACY* effort led to the Director of Sugar constituting a Task Force.

Three sugar factories were selected for a feasibility study based on prior visits. The task force finalized a draft report on cogeneration of surplus energy based on these three factories. This *ANALYSIS* component of the intervention was meant to highlight the potential in Karnataka state which had about 25 sugar factories.

The study was then presented -- the *INFORMATION* component -- to a conference in July 1993 which was attended by representatives of sugar factories, sugar technology institutes, sugar factory consultants, equipment manufacturers, financial institutions, State Electricity Boards, Ministries of Power, Sugar, Finance, Non-Conventional Energy Sources, etc., from the Government of India and State Governments and representatives of the Rockefeller Foundation and UNDP. This was the first time that all these potential actors in a programme for the implementation of sugar factory cogeneration had come together for a frank and serious exchange of views on the importance of the technology. The gathering was possible because the organizer was not a consultant and was therefore accorded a "honest broker" status.

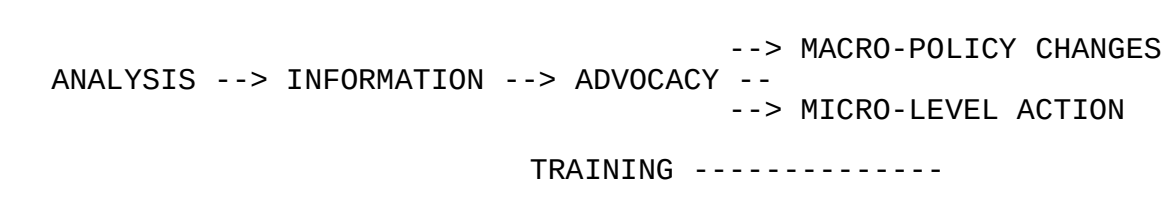
The discussion of the techno-economic study permitted the *ADVOCACY* component in which a consensus was reached that sugar factory cogeneration was technically feasible,

economically viable and financially attractive. Once most of the actors were convinced, the *ACTION* component of the intervention was launched with action-oriented consensus recommendations of the workshop. Of particular note was the recommendation to go ahead with the preparation of detailed project reports (DPRs) which were a necessary condition for the financial institutions to consider funding the implementation of sugar factory cogeneration of surplus electricity. The meeting concluded with a request for follow-up measures on the recommendations of the workshop.

The next step in the *ACTION* component of the intervention consisted of informing various sugar factories in the contiguous states of Karnataka, Maharashtra, Tamil Nadu and Andhra Pradesh that a few DPRs could be funded to the extent of 50% of the cost. Two factories in Karnataka and one in Maharashtra have completed their DPRs, and two or three more sugar factories are getting consultants to prepare DPRs.

Meanwhile, after attending the April 1993 conference in Bangalore, the Ministry of Non-conventional Energy Sources (MNES) announced an assistance package to sugar factories implementing cogeneration projects. A grant of about $ 225,000 per megawatt of surplus electricity, or 30% of the cost of installation, whichever is lower, has been announced. Thus, *ADVOCACY* has influenced the Government of India to take *ACTION* and change the policy environment in which sugar factories consider cogeneration.

From the above description, it appears that the following pattern of intervention involving INTAAACT components has been pursued:




[SCR: ADD THE CAPE TOWN EXAMPLE AND IF NECESSARY SHORTEN THE COGEN CASE]

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