

## Energy Services in International Trade: Implications for a Developing Country like India

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### INTRODUCTION: COMMERCIAL ENERGY MIX

We all understand that energy must be available, accessible and affordable. But let us remind ourselves that it varies amongst countries and regions and in spite of the growing awareness of environmental implications, the 20<sup>th</sup> century has ended with the world's commercial energy mix as follows:

- Fossil fuels - 85 per cent
- Hydro - 9 per cent
- Nuclear - 4 per cent
- New renewables - 2 per cent

Nearly two billion people (one third of the world's population) have no access to modern commercial energy forms such as electricity and oil.

### 1.0 ENERGY-ENVIRONMENT INTER- FACE

The energy-environment interface is dictated by greenhouse gas implications. Unless current  $CO_2$  emissions are reduced to 60 per cent, there could be a major climate shift by 2050. In the global scenario:

- Current levels of  $CO_2$  are the highest in 200,000 years;
- The Year 1998 was the warmest year in the history according to WMO;
- The rise in temperature by 2100 AD could be  $3.5^\circ C$ ;
- Sea levels are expected to rise by 1.5 feet, putting 100 million people at risk from flooding and storm surges;

- Island nations would lose a sizeable amount of land.

According to one estimate, if the world's fossil fuel consumption alone continues to increase at an annual rate of 2.79 per cent, the sea level may rise by 1.33 feet by 2050 itself.

### 2.0 ENERGY ISSUES FACING THE DEVELOPING NATIONS

The issues facing the developing countries are somewhat different. The crucial energy related issues for them are the following:

- Accessibility to energy is extremely poor, even to satisfy basic human needs.
- Energy efficiency becomes relevant only when energy becomes available.
- The choice of renewable versus non-renewable.
- Choice between environment-friendly versus environment-polluting and sustainable versus non-sustainable energy forms arises only when these options are available to the average person.

The stark reality is that people in developing countries use resources in their least energy-intensive forms - for example, wood chips, crop residues and cow dung - and usually in ways that are damaging to both human health and the environment.

In India 133 million tons of firewood, 73 million tons of cattle dung and 41 million tons of agro wastes and other biomass are burnt annually, with huge emissions of smoke and grit (particles of

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carbon) detrimental to the health of rural women and children.

### 3.0 INDIA'S ENERGY SCENARIO

- Thirty-six percent of the population of 1 billion live below the poverty line and cannot afford any form of commercial energy.
- Energy supplies in rural India, where 70 per cent of the population live, are of poor quality and unreliable.
- About 90 per cent of rural households use firewood, chips and dung cakes as a primary source of energy for cooking.
- India, which has more than 16 per cent of the world's population, has only 6 per cent of the world's coal reserves and only 0.6 per cent of oil and gas reserves.

The Indian electricity scenario is also very intriguing. For instance:

- Installed capacity has exceeded 110,000 MW generating more than 550 billion units/year.
- A declining hydro share causes thermal plants to back down during off-peak hours. The all-India average PLF of thermal plants, which currently stands at 73 per cent, could have been 77 to 78 per cent with a judicious hydro:thermal mix. The present installed capacity breakdown is: thermal, 70 per cent; hydro, 26 per cent; nuclear and new renewables, 2 per cent each.
- India's average cost of supply could have been Rs 2/kWH against the present value of Rs 3.5/kWH with the reversal of Hydro : Thermal mix.
- Transmission and distribution (T & D) lines are spread over 5 million circuit kilometers, which represents more than a dozen times the distance between the earth and the moon.
- 400 million (77 million households) out of 1 billion people have no access to electricity.
- Per capita consumption is less than 1 unit a day.
- One third of electricity consumption is in the rural sector (40,000 MW connected to agricultural pump sets).
- One in 100 Indians owns an agricultural pump set, India being an agricultural country.
- Eighty-five per cent of villages are electrified, but only 31 per cent rural households have electricity.

- The present energy shortage is 7.1 per cent, and the peaking shortage is 11.2 per cent.

### 4.0 LARGER QUESTIONS THAT INDIA FACES TODAY

Although even in their teens, young Indian girls have to walk miles and miles to collect firewood for their daily cooking. What demand side management would you offer to these energy-starved people?

The emerging areas of non-conventional environmentally-friendly energy sources do not have enough funding support to provide a one-time subsidy of \$1 per improved wood stove to all such deprived people, despite existing international funding mechanisms such as the Global Environment Facility.

Can the international community, under the sacred banner of the United Nations, think of evolving strategies for efficient access to energy, keeping deprived people in mind? Can we strengthen their competitive position in the energy - environment interface? Can we negotiate commitments in energy trade or services in support of these people?

Mahatma Gandhi gave Indians a prescription for any service, be it energy service, as follows:

“Whenever you are in doubt . . .

Recall the face of the poorest and the weakest man whom you may have seen, and ask yourself if the step you contemplate is going to be of any use to him, will he gain anything by it? Will it restore him to a control over his own life and destiny?”

### 5.0 RENEWABLE ENERGIES AND THE ENVIRONMENT

Renewables all over the world are either “environment-driven” or “energy-security-driven”. For Indians, renewables are also ‘conscious driven’. Mahatma Gandhi, the Father of our Nation, gave us a philosophy of life based on consciousness. Amongst many words of wisdom, he said:

- “There is enough in nature for everyone's need but not enough for everyone's greed.”
- “What India needs is not mass production but production by masses.”
- “India lives in her villages.”

Translated into modern terminology, what Mahatma Gandhi was saying was:

- “Contain your greed and do not exploit nature unwisely, recklessly and ruthlessly, or else it will retaliate in the form of greenhouse gases, acid rains and so on.”
- “Let the masses be involved in production in a decentralized manner (Distributed Generation), so that they are productively employed and the carrying capacity of a modular eco-system does not break down with large-scale development interventions.”
- “Do not ignore the energy needs of the rural millions.”

That is precisely where renewables fit in!

The Indian perception with regard to renewables has been based on the spirit of the Indian soil, generated many decades before the Rio Summit or the creation of the Global Environment Facility, which have only reinforced the Indian concept of a “sustainable model of development” - ensuring energy for ever and for all.

Moreover, with the present rate of consumption:

- India, as well as the rest of the world would exhaust all its oil, gas and easily minable coal within 50 years.
- Nuclear resources may last us for 100 years and Coal (with difficult mining) for another 200 years.

We have just 50 years left to switch to renewables in a substantial manner (conventional hydro as well - as new renewables such as wind, solar and bio energy).

## 6.0 SOLAR ELECTRIFICATION: A CASE STUDY

Pavur is a small village in South India, inhabited by the tribals in Kerala State bordering Karnataka State; though officially declared an electrified area, it never gets reliable power. Household electrification in this village under the “Bhagya Jyoti” Scheme has proved futile since a large power cut is experienced in rural feeders and the voltage dip is very high (120 V against 230 V). The problem is further compounded by some relatively richer families using voltage boosters in their houses. These tribals depend on basket weaving and making bidi (raw

tobacco cigarettes), besides farming, to earn a living. The main cause of their poverty is low productivity and lack of education.

It was realized that the root of the problem was poor lighting. They could not get enough hours of basket weaving after collecting the wild creepers from the nearby forest, as they arrived home only when it was dark and the light in their houses from the small kerosene lamps, though enough for bidi rolling, was grossly inadequate for weaving large size baskets. It was also found that many of the tribals and their children had health problems due to inhalation of the smoke from kerosene lamps they used at night; the quality of the kerosene lighting lessened the enthusiasm among the children to study; and most of the older women were suffering from severe eye problems as they have been working under poor light conditions for decades.

### 6.1 PV Intervention in Pavur

The tribals, with annual household income ranging from Rs. 2,000 to Rs. 20,000, cannot afford to buy the proposed two-lights PV systems on an outright purchase basis. However, through appropriate credit mechanisms, they can afford the so-called unaffordable PV systems of the following specifications:

|                                  |                      |
|----------------------------------|----------------------|
| PV module size                   | : 18 Wp              |
| Compact fluorescent lamps        | : 2 nos. of 9 W each |
| Battery size                     | : 12 V/ 40 AH        |
| Autonomy                         | : 2.7 days           |
| Cost of the two-lights PV system | : Rs. 11,500         |

A revolving fund - the Basket Solar Fund (BSF) - has been created by Winrock International; it can be used for financing PV systems on a “sustainable” commercial credit basis.

### 6.2 Implementation and Recovery Mechanism

The local Don Bosco Society was already helping the tribals in marketing their baskets at a fair price in urban areas. Realizing the utility of PV lighting systems, the tribals have authorized the society to supply them with the lighting systems and deduct the monthly instalments from the sale proceeds. The

money being collected is the principal with a nominal rate of interest (7.5 per cent) to offset the inflation so that the revolving fund is sustained.

A total of 120 homes in the village were identified for supply of PV systems. The scheme now in place has initial seed capital for financing 120 lighting systems. A revolving basket fund has been created with the objective of collecting the funds from the users of PV systems, who will repay the cost of systems with additional interest, and this fund be reused to finance additional systems. The beneficiaries/users are paying Rs. 150 every month towards the cost of the system out of a net increase of Rs. 600 in their income from the increased productivity of basket weaving.

## 7.0 INDIA'S INITIATIVES IN THE ELECTRICITY SECTOR

- Government commitment towards "Electricity for All by 2012", comprising rural electrification by 2007 and household electrification of rural areas by 2012;
- Accelerated Rural Electrification Program for One Lakh villages and One Crore rural households;
- Rural Electricity Supply Technology (REST) Mission for decentralised distributed generation;
- Restructuring and corporatization of State Electricity Boards;
- Electricity Regulatory Commissions in States and in the Centre;
- Decreasing subsidies in the agricultural sector in due course;
- Hydro Policy - 1998 to facilitate accelerated development of hydro;
- 50,000 MW Hydro Initiative;
- 100 per cent metering;
- Energy Conservation Act 2001;
- Electricity Act 2003: Central legislation introducing transparency, competition, efficiency and economy in a regulated environment;
- Renewable energy policy;
- Standing Committee on National Training Policy for the Power Sector;
- Standing Committee on Perspective Plan for R&D in Power Sector - A road map for 15 years;
- Encouragement to independent power producers (IPPs);

- Mega Power Policy;
- Captive Power Policy;
- Power sector reforms : APDRP etc.

## 8.0 INDIA'S DIVERSITY - A CHALLENGE FOR ENERGY PLANNERS

India, a country of continental dimensions supporting a population of 1 billion, is situated in a tropical zone with a diversity of resources.

As a monsoon-governed country, it has huge hydro potential, ranking fifth in the world, 75 per cent of which is concentrated in the Himalayan belt, particularly in the North-Eastern Region. It has a huge stock of coal reserves (82.39 billion tonnes), primarily located in the States of Bihar and Madhya Pradesh in the central zone and Andhra Pradesh in the southern part of the country. Wind resource is considerable in the coastal areas of South India, particularly during monsoons. Solar incidence is highest in Rajasthan State and is also considerable in other States.

Rural electrification poses a special challenge in this vast country, where 70 per cent of the population lives in villages. While 85 per cent villages have been electrified, more than 80,000 villages remain to be grid-connected, being situated in difficult areas. More than 18,000 villages and hamlets are such that they can never be reached by grid extension and will have to be energized through renewable sources such as small hydro, solar, wind and biomass. Some are suitable for establishing local/mini grids. Non-conventional energy sources can also be useful in supplementing electricity supply in the rural areas, which are very poor in terms of tail-end voltages and reliability of supply.

The capacity to pay varies largely in different strata of society in India. Thirty-six per cent of the population lives below the poverty line, and cannot afford any commercial forms of energy. They deserve to be helped by micro-credit mechanisms. Therefore, the use of different forms of energy, intermittent and otherwise, needs to be offset against their affordability.

In such a diverse country we therefore have to think of a National Grid for bulk transmission of power from the resource-rich regions to the power-needy regions through massive bulk transmission

lines such as HVDC. Also, we have to go for decentralized power generation and isolated mini grids. We have to strive hard to keep an optimum balance between fossil & non-fossil fuel generation, while giving a determined thrust to conventional hydro and new renewables in the coming decades.

## 9.0 ENERGY CONSCIOUSNESS

Developing countries are also aware of environmental degradation through carbon emissions, hydrofluorocarbons and the like, as well as of the need to control emissions. For a typical country such as India with diverse living standards, it is difficult to balance development and environmental protection. On the one hand, India is trying to elevate the poor up to the sustainable living conditions, and on the other hand, making conscious efforts to sensitize the masses about energy efficiency and energy conservation.

“Every one of us can generate power by conserving electricity”, “Renewables can prime the growth process that is sustainable” and “We have just 50 years to switch on to renewables”, “Environment First - Safety First” are the concepts on which the National Power Training Institute (NPTI) is conducting energy consciousness programs for the masses.

NPTI has sensitized 93,866 people on different aspects as follows:

|         |        |                             |
|---------|--------|-----------------------------|
| 2000-01 | 26,782 | Energy Conservation         |
| 2001-02 | 14,093 | Power Reforms               |
| 2002-03 | 17,970 | Electrical Safety           |
| 2003-04 | 35,021 | Energy -Environment Linkage |

## 10.0 STRATEGIES FOR ENERGY SERVICES IN DEVELOPING COUNTRIES

- Basic energy service in humanitarian terms;
- No give and take from the very beginning: service first and business later;
- No blind technology transfer: re-engineering to suit local conditions utilizing local talent;
- The developed countries should not start with a basket of technologies and services known to them, but should first study the developing countries' needs in terms of energy resources,

energy demand, appropriate technology, eco-friendly options, affordability, growing population and its aspirations. And then package the technologies and services;

- Encourage local capacity building, and partnering with local companies for mutual benefits.

## 11.0 PARTNERING FOR VALUE-ADDED BUSINESS

“Labour is cheap in developing countries” is a notion that needs reorientation. Is it not reducing a man or a woman to a mere worker, just a hired commodity or resource engaged in the economic process? Under such a perception, he or she becomes an objectified and standardized component of the production process, who can be fired at any time.

This happens when we forget that:

- Man's intuitive instincts can fetch millions of dollars!
- Man's value added can be tremendous, indeed immeasurable!
- Man, for a given vision, mission or value, when motivated to the right degree, can resonate with an infinite amplitude and achieve astonishing levels of performance!
- Man has “super-conscious” powers, of which not more than 10 per cent is consciously utilized.

So, if you look for partnership - not only for local labour but also for its inherent talent - you can have much more profitable business, with plenty of value added !

For example, the United States has profitably utilized the Indian talent. Today:

- 38 % of doctors in America are Indians;
- 12 % of scientists in America are Indians;
- 36 % of NASA Scientists are Indians;
- 34 % of Microsoft employees are Indians;
- 28 % of IBM employees are Indians;
- 17 % of Intel Scientists are Indians.

## 12.0 BALANCING THE STRATEGIES BETWEEN DEVELOPED AND DEVELOPING NATIONS

A balanced strategic reorientation of the mindsets of the developed and developing nations would go

a long way in creating a better world. A four-point strategy could be considered, as follows:

- Disentangle from mere arithmetics of carbon credits or assigning obligations to each other; focus on translating environmental objectives into actions;
- Developing nations should refrain from ignoring the environment in their quest for speedy economic growth;
- The dependence of the developing countries on bilateral/multilateral funding for environmental measures should not hinder the internalization of environmental concerns in the development process, which should be a matter of conviction;
- Environmental concerns should not be exaggerated, so that the basic development projects aimed at the ensuring survival of poor societies are overloaded.

However, survival comes first, and then its improvement. Let us energize human lives to bring about world peace, joy and togetherness.

### 13.0 SPECIFIC RECOMMENDATIONS

More than 2 billion people, mostly in developing countries, have no access to modern commercial forms of energy. Since their ability to pay is extremely limited, energy services should be provided to them on humanitarian terms, in accordance with the “service first, business later” principle. This would require a common fund for establishing

micro-credit mechanisms with moderate rates of interest just to set off inflation, so that the fund becomes a “revolving fund” ever multiplying the number of services provided to deprived societies.

Transfer of technology for energy services between developed and developing nations should not start with a basket of technologies and services familiar to the former.

Developing countries’ needs should first be studied in terms of:

- Energy resources;
- Energy demand;
- Appropriate technology;
- Eco-friendly options;
- Affordability;
- Growing population and its aspirations.

Only afterwards should the technologies and services, appropriately re-engineered to suit local conditions, be packaged.

While extending energy services, look for partnership, not only for local labour but also for its inherent talent, in order to have much more meaningful and profitable business, with plenty of value added!

Such partnerships would not only be sustainable and profitable, but also bring about togetherness amongst societies and unite the nations of the world to work for a common sustainable future, in which the energy and the environment are appropriately interfaced.