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SOME CONSIDERATIONS ON MINI HYDRO GENERATION UNITS DEVELOPMENT AND APPLICATION*

JYOTI LIMITED **

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1. Present Position

The small hydel electric generating units had to fight its way towards universal acceptance as an economically viable utility. Its development and importance remained obscure for many years. It is surprising that relatively little attention had been paid to what could have been a development of considerable importance.

(A) International Scene.

However, many countries - notably Czechoslovakia, Austria, France, Italy, Sweden, China, USSR and Switzerland planned and implemented their Power Plans while making full use of tremendous small/micro hydro potential.

Of late, the role of small micro hydel units is being increasingly recognised all over the world. With the increase in the fuel oil price it is expected that such units will play greater and greater role in time to come.

(B) Indian Scene.

In recent past more than 100 sets have been supplied by Jyoti and are commissioned in India alone augmenting the power generation over 20,000 kW. The rating of these sets are from 50 kW to 1000 kW. Some sets of 160 kW to 500 kW rating are exported by Jyoti which are successfully commissioned. Unlike oil or coal, there is neither transportation nor storage problems involved in installing micro/small hydel units. The system does not cause any pollution either. The forest wood which is presently being burnt for fuel can be saved adding to the national wealth. The economic and social conditions of the people living in remote hilly regions can be improved in a short period by providing power through micro/small hydel sets.

Inspite of the advantages, in India micro hydel sets generally get second priority compared to large hydel schemes. Even though it is possible to go for small hydel sets in a big way.

2. Future Plans.

(A) Power Generation.

The alternative energy sources like solar, Tidal, wind, Biogas etc. are still to reach a stage of full development where they are both technically and economically attractive propositions. The large systems - whether nuclear, hydel or thermal require heavy capital outlay and long gestation period. The inherent advantages of low to moderate investment, quick implementation period, easy maintenance and simplicity of operation of small micro hydel sets are now recognised.

The change in outlook from "Bigger is Better" to "Smaller is equally Better" is the need of the day.

This change in attitude has to first come about at the top level of the decision making authority including the concerned technocrats and administrators. The process of this change may be difficult in nature; but the change has to be accomplished. In fact, it is not merely a matter of opinion but of conviction.

(B) Irrigation plus Power Generation.

Irrigation canals, if provided with standard drops, can be a source of not only food but also of power by installing small hydro generating sets. Now that their economic viability is well established, any country endowed with suitable topography and water resources can plan its power generation and utilisation programme effectively - WITHOUT waiting for macro level technology or power stations; whose benefits are mainly derived by a few selected and mostly urban areas. Standard canal drop micro hydel sets are being developed to meet such requirements.

(C) Instrument for community welfare.

Since they are very useful in rural uplift programmes, the small/micro hydel sets combine both the social and economic objectives and therefore, are eminently suitable for any developing country. Many sets supplied by Jyoti to hilly areas of Uttar Pradesh, Himachal Pradesh and NEFA have changed the social outlook and have brought economic development of these areas.

In anticipation of this trend, by more and more acceptance

JYOTI has already planned the expansion of its production capacity, of standard micro hydel sets in a big way.

3. Research & Development

In the initial stages, the emphasis had necessarily to be on workable designs. The process of development continued for increasing the efficiencies of the equipment involved. The R & D efforts in future will naturally continue to have this primary requirement in mind. However, other equally important aspects such as size reduction and thereby cost reduction, improved materials, modular construction wherever possible and standardisation will assume greater importance.

Since most of these units will be in remote areas the emphasis is to design and develop such sets which require minimum maintenance which can be carried out by semi-skilled people. Engineers and Scientists are now engaged in developing units with emphasis on " System Approach" ; and techniques which identify incipient failure modes of operation will assume importance.

Complete system design of turbines with Synchronous and induction generator is being developed for canal power generation. The Research & Development work to design tubular turbine to generate power on canal is under progress.

JYOTI had recognised the need of indigenous research and development efforts almost right from its inception and, over a span of time, this activity has bloosomed appreciably. At present JYOTI is able to develop, design and manufacturing micro hydel sets meeting varied topographical needs.

4. Lessons learnt.

During last 2 decades of design, manufacture, erection and commissioning of these sets JYOTI has come accross some of the areas where more thought and planning is needed. Some of these are:

a) Very often the primary data like reliable maps and contours, considerations of accessibility and approach to a possible site, nature of terrain, rain-fall pattern, approximate measurements of heads and flows etc., is not available.

b) Transmission line distances to the load centres and load and utilisation factors are often not given adequate thought.

c) Many times, the failures have occured in the system because of improper civil work e.g. water conductors, desilting arrangement and foundations.

d) Maximum utilisation of the locally available resources and exploration of cheaper alternatives(without sacrificing the quality, is not seriously considered. The improvisation and " value engineering " techniques may often prove to be rewarding to the consumer.

e) Certain basic technical knowledge of the concept of small/micro hydel sets, familiarity with their operation, proper maintenance and training of the concerned people(in advance) is lost sight of.

f) Due to the limitations on dimensions and weights(imposed by geography), the scheme infrastructure like approach roads should be completed in advance.

5. Socio-economic aspects.

The per capita electricity generation and utilisation index is now recognised to be a definite indication of the stage of development of any society. In fact, it may well be said that Energy Index is the life Index. Small/micro hydel sets can provide the necessary impulse, trigger the process and also function as catalysts of change in an underdeveloped area for this purpose. Some obvious benefits are as follows:

a) development of cottage industries
b) growth in employment opportunities
c) raising the standard of living
d) providing the basic necessities of life and - last but not the least.
e) this progress leading to further progress.

Moreover, the canal drops installations - by feeding the power into the system - can save the precious and perishing fossil fuel.

6. Technology transfer problems

The problems foreseen are as follows:-

a) Lack of awareness of potential and lack of congenial environment for the relization of potential.

b) Lack of positive attitude and committment to small/micro hydel sets. Performance for large sets.

c) Lack of basic techno-commercial infrastrucutre for the back-up purpose.

d) Lack of requisite manpower skills and tranining facilities.

7. Suggestion for the organisation of the sub-net work programme which may be best suited for the country of ESCAP region.

A) The implementation of Micro/small hydel schemes in a big way suffers due to lack of proper organisational net work and planning.

Suggestion for organisation net work.

1) A seperate national body may be formed for the preperation of project feasibility report and sanctions so that small projects can be implemented in large scale.

2) Seperate cells may be formed in electricity boards to implement small/micro hydel projects.

3) Organisation system should be streamlined to have proper coordination between electricity boards and irrigation department for standardising canal drops and generation of power through canal drops.

B) Planning for mini grid system.

While there is always the need for national power grid for any country, its establishment is a time-consuming process requiring huge resources. Moreover such grids can not reach remote inaccessible areas. While such activity at Macro level is going on, smaller girds can certainly be formed in numerous small/micro hydel sites exist in a given area. The only prerequisite is certain minimum "density" of small/micro hydel sets in that area, so that economic feasibility of the "System" is obtained.

The principal advantage of such sub Net-works will be in their utility to those areas which may be fairly low in order of priorities in Electrification programmes. If endowed by the Nature with small/micro hydel potential and given the basic infrastructure, even small remote habitations can catch up with the mainstream of developmental efforts. Secondly, the load centres then need not be necessarily very close to the small/micro hydel sets. The adjoining areas can also thus derive the benefits of electrification.

Conclusion

In the contemt of the prevalent Energy Crisis all over the world today, the power generation by small/micro hydel sets is going to play a very citsl role in time to come. The importance of this mode of power generation will go on increasing. It is, therefore, in the nature of things that right from now this avenue is explored fully and its immense potentiul is tapped to them maximum extent.

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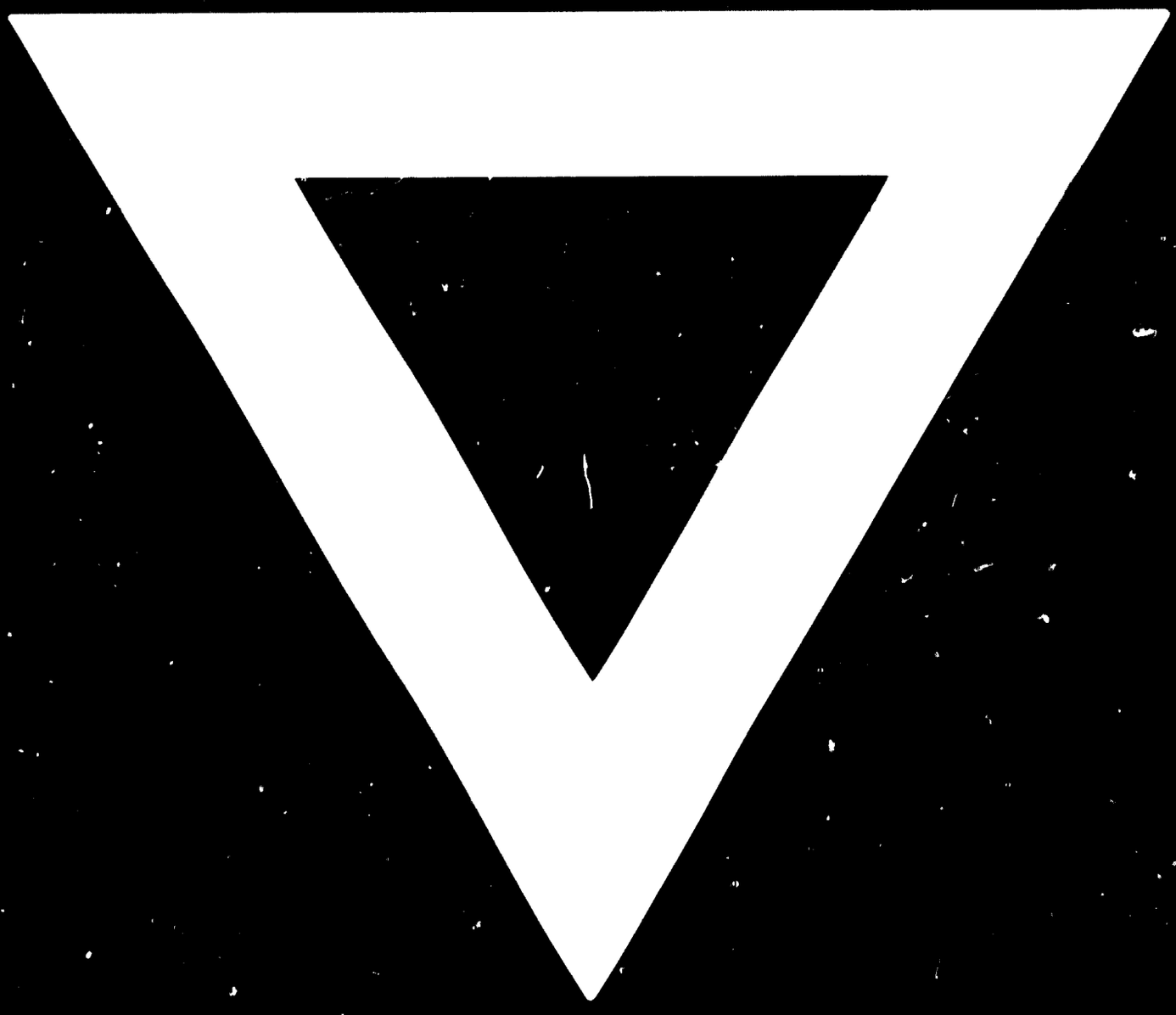

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