EXECUTIVE SUMMARY

0.1 INTRODUCTION

High Pressure Sodium Vapour Lamp (HPSVL) belongs to a family of high pressure discharge lamps. It is considered to be an energy efficient lamp for bulk lighting, where colour rendition property is not very critical. The lamp is used for highway lighting, ports and docks, railway yards, workshops, airports and others. In India the production of this lamp was started in 1980 after a lag of almost 17 years since its introduction abroad in 1965. Today, there are 12 lamp manufacturing units in the country with installed capacity of 10 lakh lamps per annum against the total demand estimated to be 6.61 lakhs (1991). The industry is growing at an annual rate of 20% per annum.

0.2 Sources of Technology

In international arena there are 9 companies, GEC & Thorn U.K., OSRAM in Germany; Westinghouse, General Electric, and Sylvania in USA; Philips in Holland; Tungsram in Hungary and Iwasaki in Japan who have the HPSVL technology. These companies have world wide operations through their subsidiaries and only a few amongst them have given technologies to outside companies. In India, technology supplier companies are Philips, Tungsram, Osram and Thorn.

The present operations in Indian units are limited mainly to assembly of lamps and do not include production of raw materials and major components. Only three units were specifically set up with manufacturing facilities for HPSVL production while the rest took HPSVL production as a diversification activity or making better utilisation of existing facilities already created for mercury vapour lamp which required similar production set up.

0.3 SOURCES OF HPSVL RAW MATERIALS/COMPONENTS

Abroad the lamp manufacturing industry has well developed supporting industries to meet the requirements of raw materials and components. However, in India there is no base of such supporting industries. At

present, components such as ovoid and tubular glass shells, soft glass shells for low wattage lamps and lamp caps are made in the country. The critical parts like arc tube, lead-in-wire and nickel strips are mostly, procured from collaborator, though there is no such restrictive clause in collaboration agreements. The other components - glass shell and tubing are procured from SCHOTT of Germany and getter rings from SAES, Italy. These companies specialise in making the above items and supply these to many international companies.

A beginning has been made for the manufacture of arc tubes in the country as at least three companies Philips, Apar and Kalpana have set up the required plants. Presently, SCT of France and Feldumuhle of Germany are holding discussions with the local companies, which are in field of industrial ceramics for manufacture of 99.95% purity polycrystalline alumina and its tube. For achieving self-reliance, it is essential that technical "know-why" and "know-how" be obtained for the components and raw materials of discharge tube manufacture. As most of the technology holders are reluctant to part the technical know-why, it is essential that country gives vigorous thrust to indigenous R&D in this area. Similarly, to realize high overall lighting systems efficiency, continuous upgradation of the performance characteristics of indigenous luminaries and control gear is necessary. Alternatively, the relevant technology can be acquired from abroad.

0.4 PRODUCTION CAPACITY

The HPSVL production chains in existing units are geared to produce 200 to 300 bulbs per hour. The basic process of lamp making being similar, same chains with small changes in process and balancing equipment can be used for making HPMVL and metal-halide lamps. Hence, it is difficult to assess installed capacities for HPSVL separately. The production is not regular and depends on order position. In four units, Apar, Philips, HMT and Mysore Lamps, the same chains are used for producing mercury vapour and sodium vapour lamps. Only in one units i.e. Twinkle it is exclusively used for HPSVL production.

0.5 EXPORTS

The HPSVL industry has made a modest beginning in exports. M/s. Apar, Mysore Lamps and Twinkle Lamps have exported lamps to countries like Dubhai, Australia, Zambia and Nepal. Apar have also

received order from Thorn-Singapore for 3000 nos. 70w HPSV lamps. The major constraint in exports is the high cost of the raw material, which account for 85% of the lamp cost and 75% of it is imported. The Government has Duty Exemption Scheme (DES) which offers a possibility of importing the components without paying the import duty. To qualify for the exemption under DES, it is necessary that 33% value addition be done in manufacturing. With the present level of imports, is very difficult to take the benefit of DES scheme.

0.6 LAMP MACHINERY

All major lighting companies abroad also make the lamp making machinery and offer this along with the technology as a package. This invariably leads to high cost of technology transfer. In India there is no base for lamp machinery manufacturing except for HMT which made some beginning but failed to rise to the industry's expectation. The small scale sector has developed a few machines for tube cutting, flare making, evacuation, sealing, stem making and lamp testing. The sophistication of the machines is no way comparable to machinery produced abroad. Serious efforts are required to be made to establish a strong base for machinery manufacturing within the country. The leading machinery manufacturing units in India may take up the development of these machines.

0.7 RESEARCH AND DEVELOPMENT

There is no R&D base in the country doing "BASIC" research in the lighting area. The HPSVL technology is extremely complex involving technologies related to ceramics, glass, gases, high temperature metals and electronics. Country does have a few national level laboratories like National Physical Laboratory, Central Glass and Ceramic Research Institute, Central Scientific Instrument Organisation, National Electro-Chemical Research Laboratory, and Central Power Research Institute, whose facilities can be utilised for research in above areas. What needs is the clear identification of R&D projects by the industry which can be sponsored in these institutes with a close liaison between industry and R&D laboratories. Unit level R&D may not be able to do much due to the large funds required for this kind of research. Creation of a national level body on lighting technology on the lines of Central Machine Tool Institute (CMTI) and National Institute of Foundry and Forge Technology (NIFFT) would be desirable.

0.8 FUTURE TRENDS

The industry in India is keeping a close watch on the developments in the world lighting industry. Environmentally conscious societies in the West prefer light sources which are nearer to the natural light. In this respect metal-halide lamps are superior to HPSVL. The only drawback is that they have lower luminous efficacy. Efforts are being made abroad to improve the efficacy of halide lamps and HPSVL. However, the basic characteristics of these two types of lamps are such that efficacy of HPSV lamps will always be higher than metal-halide lamps, it is unlikely that later will completely replace HPSVL. In India, HPSVL will continue to dominate the bulk lighting application area in foreseable future. Metal-halide and high colour rendition Index (Ra85) HPSV lamps require strict control of ectricity supply parameters which is not available in the country.

0.9 CONCLUSIONS

Developing Home Market

There is need to develop home market for energy efficient lamps in the country. This is essential on two counts. First, it will spur the indigenisation of lamp components by bringing down the cost of production which in turn will make Indian made lamps competitive in international markets. Secondly, within the country itself, lower prices will promote greater usage of these lamps there by saving energy in lighting sector. Great potential exists in this case as lighting sector in India accounts for about 17% of total energy consumption compared to 8% to 10% in the advanced countries. In India, General Lighting Sources, Florescent Tube Lights and Mercury vapour lamp account for bulk usage for lighting which are less energy efficient than sodium vapour lamps.

The major impediment to growth of HPSVL usage in India is lack of indigenous base for component production, which in turn is due to low volume demand for HPSVL in the country. Present volume is not sufficient to make indigenous production viable. Only when demand grows, production cost can be reduced by taking advantage of economy scale of operation. This is a viscions circle as demand and cost of production are inter linked. To reduce cost of HPSVL, growth of home market is prerequisite.

Study for Replacement of Other Lamps by HPSV Lamps

Abroad, replacement of higher wattage mercury vapour lamps by lower wattage sodium vapour lamps using same control gears is in vouge to save energy. The normal practice is to replace 400 W HPMV lamp by 250 W HPSV and 170 HPMV by 100 W HPSVL. Special plug in type of HPSVL lamps have been developed which can be used directly on HPMVL installation without change of control gears.

In India such replacement, offers great scope for energy conservation. A study can be undertaken to find the scope and quantum of saving possible through replacement of HPMPL by HPSVL in major installations in India.

Poor Luminaire Designs

The luminaire design has profound impact on energy conservation as luminaire forms an important part of total HPSVL system. Luminaire design affect performance in two way: Efficiency with which it reflects final light output from HPSVL source and secondly, how efficiently it disseminates the heat produced during the operation of the lamp. The poor dissemination of heat, reduces the lamp life. In India luminaire manufacturing is done mostly by the small scale sector and they do not have necessary expertise and infrastructure for design.

Non-availability of Skilled Manpower

Lighting technology is very complex which comprises diverse subjects like optics, metallurgy, electronics, instrumentation, ceramics, glass etc. Skilled persons are difficult to get both at operating and managerial levels. Most of the times lighting industry has to draw fresh university graduates in each discipline and train them in-house. Same is true for operator level personnel. Because of shortage of skilled manpower, jumping of jobs from one company to another is quite frequent. This seriously hampers the operations of the units. In order to create trained manpower, specialised courses both at ITI and degree level need to be started.

Data on Lighting Technology

There is no basic data source available in the country on lighting

technology and uses. Industry is badly in need of such data sources to plan their future strategies.

Lack of Indigenous R&D Base

R&D base in lighting sector is not strong. Of course the leading companies like Philips, Apar, HMT, Mysore Lamps do have R&D set ups, but they are basically engaged in solving process/quality related problems and nothing significant is done in basic research.

Some of the CSIR labs like, National Physical Laboratory, New Delhi, Central Glass and Ceramic Research Institute, Calcutta do have good infrastructure and manpower to undertake research in lighting area. They have so far concentrated in testing but, not much attention is given on basic research. Some defence laboratories like Electronic Test Laboratories of DGQA, Bangalore are having good facilities. These laboratories can be utilised for creation of sophisticated test facilities of high pressure sodium vapour lamp. Industry too has also not shown interest in sponsoring research at these organisations due to commercial reasons. Unless indigenous R&D base is strengthened there is no possibility for the country to become self relint in lighting technology.

0.10 RECOMMENDATIONS

(i) There is need for developing large market for energy efficient lamps. For this purpose, bringing down lamp prices is suggested. Similarly Indian companies should be encouraged to set up component manufacturing facilities and every assistance & incentive be given to them.

(ii) The potential of energy conservation through replacement of mercury vapour lamps by sodium vapour lamp is significant. Presently there is no data base available on energy saving which may be possible through replacement of existing lamps by more energy efficient lamps. Two measures are suggested for this : Firstly a detailed study be carried out at major lighting installations like railway yards, docks, public places, hotels, airports, industry to assess the cost-benefit analysis of replacement. Simultaneously technology import be allowed for making plug in type lamps within the country.

(iii) In order to promote healthy growth of HPSVL industry, illegal imports need to be curbed. Customs and execise department need to take stringent action in this regard. They should also collect the latest price list of different kind of lamps and their components to prevent any underinvoicing of bills.

(iv) In order to meet growing need of skilled manpower in industry, an apex institution in lighting technology at national level be established. This institute will be a nodel agency and will carry basic and applied research in lighting, design, processes, machinery, raw material, instrumentation besides training manpower. The institute will also have a national data base on lighting technology to cater to the needs of the industry. This agency will co-ordinate all inter disciplinary research with other agencies like Central Glass and Ceramic Research Institute, National Physical Laboratory, Central Electro-chemical Research Institute, Central Scientific Instruments organisation, IITs, etc. This institute should be an lines as CMTI, Bangalore, NIFFT, Ranchi, which are nodel agencies for Research in Machine Tool and Forging/Foundry technologies.

(v) In order to upgrade the luminary design it is suggested that technology import be encouraged. Similarly, R&D activities may be sponsored by the industry at unit level/CSIR labs in consultation with lamp and luminary manufacturers. Production of luminariers by organised sector may also be encouraged as they have necessary funds, manpower and infrastructure to take such activity.