1. Introduction

Section 86(1)(e) of the Electricity Act, 2003 mandates the Commission to promote cogeneration and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person, and also specify, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licensee.

Section 5.10.5 of the National Electricity Policy envisages setting up of Solid Waste to Energy Projects in urban areas and recovery of energy from Industrial effluents with a view to reduce environmental pollution apart from generating additional energy.

The Commission has issued KERC (Power Procurement from Renewable Sources by Distribution Licensee) Regulations, 2004 on 27.9.2004 specifying the quantum of purchase from renewable sources and laying down the procedure for determination of tariff from such sources. In the said regulations, the renewable sources include power generation from urban/municipal waste. Subsequently, the Commission has determined the tariff in respect of mini-hydel, wind, biomass and co-generation projects vide order dated 18th January 2005. However, Waste-to-Energy (WtE) projects were not considered while fixing tariff for biomass projects. In order to promote WtE projects, approach to tariff of such projects would be crucial.

His Excellency the President of India, during his address to the Karnataka Legislature on 20.11.2005 has stressed the need to setup waste to energy plants in Bangalore. It is stated that Bangalore produces about 2500 tons of waste per day and has the capability of setting up of seven units of 6.5MW each power plants or two units of 20MW each. It is further suggested that the GoK can tie up with CII, TIFAC and private industries that have successfully established the power plants.

KREDL has already published a paper titled “DPR for energy recovery from Municipal Wastes in Bangalore” which contains all technical and commercial details including economic analysis of the projects. The report contains
project report for setting up 1 TPD biomethanation plant and a 50 TPD biomethanation plant. (please refer to KREDL website www.kar.nic.in/kredl/).

Bangalore Mahanagara Palike (BMP), after inviting competitive bids for a WtE Project, has awarded the project to M/s Srinivasa Gayatri Resource Recovery Ltd (SGRRL) in June 2005. According to the details provided by SGRRL, the project is located at Mandur village, Bangalore, it is an integrated project consisting of Process Plant to derive enriched fuel from Municipal Solid Waste (MSW) and a power plant of 8 MW and the project cost for the process plant is around Rs.26.53 crores in the 1st phase. GoK in its order dated 14.10.05, while allotting the project to SGRRL has directed it to enter into a PPA with BESCOM. SGRRL has requested the Commission to determine the tariff accordingly. SGRRL has further stated in Dec 05 that the tenders for the EPC contract has been floated and the DPR will be firmed up soon after the offers are available and the DPR would be furnished to the Commission.

There may be similar WtE projects coming up in future in the state and therefore there is need to determine a common approach on tariff for such projects, so as to promote generation of power from WtE projects. Hence this paper.

2. Need for WtE projects:

Households, commercial and industrial activity generates large volume of waste. This waste generation is continuously increasing with the rapid urbanization and Industrial development. Such large volumes of waste have created environmental pollution in terms of air pollution, water pollution besides emission of toxic substances. The current method of waste disposal i.e. landfill, requires large tracts of land and is becoming economically and environmentally unacceptable.

The ill effects of inadequate and improper waste disposal have called for the urgent need for efficient waste disposal techniques. Globally, efforts are being made for reducing Green House Gas emissions, Effects on Climate Change and Global Warming.

Environment friendly technologies can be adopted for treatment and processing of waste before it is finally disposed of. These technologies also provide for decentralized power generation along with improving the quality of waste and subsequent reduction in pollution. These advanced waste management techniques provide the following benefits,

- Reduction in volume of waste that has to be disposed of finally
- Reduces the requirement of land for landfill
- Reduction in cost of transportation
- Reduction in environmental pollution
- Utilisation of residual waste in the form of manure.
Other socio-economic benefits to the society in terms of employment, development etc.,

Hence, the focus for better waste management should be on,

- Minimising waste to be disposed of on land
- Maximising environmentally sound reuse and recycling
- Promoting environmentally sound waste treatment (like converting waste to energy) and disposal
- Extending waste service coverage (in terms of waste collection)

3. **Promotion of WtE projects by Ministry of Non-Conventional Energy Sources (MNES):**

MNES is promoting setting up of WtE projects through National Programme on Energy Recovery from Urban and Industrial Wastes and a UNDP/GEF assisted project on development of high rate Bio-methanation Processes as a means of reducing Green House Gases Emission. The MNES has launched this Programme in 1995-96 with the following objectives,

1. Creation of conducive conditions with financial and fiscal regime to promote, develop and demonstrate the utilization of wastes for recovery of energy.
2. Improvement in the waste management practices through adoption of renewable energy technologies for processing and treatment of wastes prior to disposal
3. Promotion of projects for recovery of energy from wastes from Urban and Industrial sectors.

The scheme is implemented through State Nodal Agencies, Govt. Departments and Urban Local Bodies who have to forward project proposals to MNES in accordance with the prescribed procedure for applying for Central Financial Assistance. It is applicable to both private and public sector entrepreneurs.

As per the data published by MNES, 21 Waste-to-Energy projects with an aggregate capacity of about 26 MW have already been commissioned and projects of a total capacity of 28 MW are under installation. Proposals for a total capacity of 50 MW are under development.

MNES has provided several financial incentives & implementation arrangements through nodal agencies to eligible WtE projects. Details of financial incentives available to WtE projects as published on the MNES
website is enclosed. Project developers may please contact MNES for confirmation on the availability of such incentives to their projects.

4. Waste-to-Wealth (WtW)- successful plants in the Country:

The approach of converting waste to wealth has gained some momentum. There are already many successful plants, some are yet to be commissioned while many are under development stage. Details of the projects completed and projects under execution are given below:

**WtE Projects completed**

**TABLE-1**

<table>
<thead>
<tr>
<th>Plant</th>
<th>Highlight</th>
</tr>
</thead>
<tbody>
<tr>
<td>M/s Vensa Biotek Ltd, Samalkot, AP</td>
<td>Generates 8000cum biogas every day for the last one year</td>
</tr>
<tr>
<td>M/s K M Sugar Mills (Distillery) Faizabad,UP</td>
<td>Generates 4 lakh units of electricity every month since last four years from biogas at distillery.</td>
</tr>
<tr>
<td>M/s Kanaria Chemicals &amp; Industries Ltd, Ankleshwar, Gujarat</td>
<td>Generates 10 lakh units of electricity every month since three years from biogas.</td>
</tr>
<tr>
<td>M/s Alkabeer Exports Ltd, Rudraram village, Medak Dist, AP</td>
<td>Generates 2000cum of biogas from liquid waste.</td>
</tr>
<tr>
<td>Vishara m Tanners Enviro Control Systems, Melvisharam,TN</td>
<td>Power generated from Biogas.</td>
</tr>
<tr>
<td>SELCO International Ltd, Hyderabad, AP</td>
<td>6.6 MW plant generating power from municipal solid waste.</td>
</tr>
</tbody>
</table>

(Source: MNES website @ [www.mnes.nic.in](http://www.mnes.nic.in))

Of the above, SELCO International Ltd, Hyderabad is engaged in power generation from MSW, while other plants are other than MSW based plants. SELCO plant is supported by Municipal Corporation of Hyderabad and Government of Andhra Pradesh and is funded by:

1. Technology Information, forecasting and Assessment Council (TIFAC) and
2. Technology Development Board (TDB), Department of Science and Technology, GoI

The required land for the SELCO plant has been given by Municipal Corporation of Hyderabad and 30 year long term agreement has been made by the Municipal Corporation for supply of waste collected by the Corporation. Electricity is being sold to AP TRANSCO at Rs 3.37 Per Unit as on 01.04.2004 with an escalation of 5% every year for the next five years.
Projects under execution

<table>
<thead>
<tr>
<th>TABLE-2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MSW based project at Vijayawada</strong> by M/s Sriram Energy Systems Pvt. Ltd.</td>
</tr>
<tr>
<td><strong>MSW based project at Vijayawada</strong> by M/s SELCO International.</td>
</tr>
<tr>
<td><strong>MSW based project at Hyderabad</strong> by M/s RDF Power Projects Ltd.</td>
</tr>
<tr>
<td><strong>MSW based project at Navi Mumbai</strong> by M/s MSW Power India Ltd.</td>
</tr>
</tbody>
</table>

(Source: MNES website @ [www.mnes.nic.in](http://www.mnes.nic.in))

5. Potential for waste utilisation in the State:

The estimated municipal solid waste generation under the six municipal corporations in the state is as follows:

<table>
<thead>
<tr>
<th>TABLE-3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Municipal Corporation</strong></td>
</tr>
<tr>
<td>Bangalore</td>
</tr>
<tr>
<td>Mangalore</td>
</tr>
<tr>
<td>Hubli &amp; Dharwad</td>
</tr>
<tr>
<td>Mysore</td>
</tr>
<tr>
<td>Belguam</td>
</tr>
<tr>
<td>Gulbarga</td>
</tr>
<tr>
<td>TOTAL</td>
</tr>
</tbody>
</table>

(Source: Karnataka State Pollution Control Board, Data as in 2003)

As indicated earlier, 8 MW MSW based power generation plant is being developed by Srinivasa Gayatri Resources Recovery Ltd (SGRRL) at Mandur Village, Bangalore. According to the details provided by SGRRL, it is a 1000 TPD plant of MSW to Refuse Derived Fuel (RDF) process plant on BOOT basis, BMP has allotted 25 acres of land to SGRRL for the purpose, Technology transfer agreement for processing MSW to fuel has been
executed with APTDC which is an authorized agency of TIFAC. Further, SGRRL has stated that it proposes to generate about 350 tonnes of RDF, which will be marketed in various process industries apart from using for power generation.

It is learnt that Hubli-Dharwad Municipal Corporation has taken up conversion of waste to manure on commercial principles recently.

As in the case of BMP, the other Municipal Corporations can also take up similar integrated projects for electricity generation, sale of surplus enriched fuel, apart from making available quality manure to the farmers. BMP may also explore taking up additional projects considering the extent of MSW available at Bangalore.

The electricity generated from these WtE projects can be made use for their own consumption by the municipalities for water supply, street lights, sewage treatment plants, office lighting etc with appropriate wheeling and banking arrangement with the ESCOMs or may supply to other consumers under open access or to the grid.

The alternative models for taking up WtE projects by the Municipal Corporations are as follows:

- Build, Own, Operate and Transfer (BOOT)
- Build, Operate and Transfer (BOT)
- Build, Own, Operate (BOO)
- Build, Operate, Lease and Transfer (BOLT)

6. Approach to Tariff for WtE projects

(i) SGRRL, the project promoted by BMP, has requested the Commission to approve tariff at a base price of Rs.3.37 per unit as on 01.04.2004 with an escalation 5% p.a. as in Andhra Pradesh.

(ii) As indicated in the APERC tariff order dated 20.03.2004, it has determined the tariff for WtE projects at a base price of 2.25 per unit as on 01.04.1994 with an escalation of 5% p.a. but the escalation would be simple and not compounded which works out to Rs.3.37 per unit as on 1.4.04. The base price of Rs.2.25 per unit fixed by APERC is as per the earlier MNES guidelines for non-conventional energy projects while the annual escalation is provided at 5% simple instead of 5% compounded rate as per MNES guidelines. APERC has held this as a reasonable tariff for WtE projects. (Please see full text of the order on APERC website www.ercap.org)
(iii) The alternate approach for tariff determination of WtE projects would be to go by cost plus approach. It may not be feasible to determine the tariff on a case to case basis in view of complexities involved in project wise evaluation of project cost, fuel cost, o&m costs etc. Tariff determination on a uniform basis for all WtE projects on the cost plus approach may also pose problems for the following reasons.

(a) It may be difficult to benchmark the project cost since generally they are site specific. The project cost may vary widely between the projects.

(b) The projects are also generally integrated plants with power generation, sale of RDF, sale of manure etc that may be unique to each project.

(c) There are many tangible and also intangible benefits from such WtE projects, which would be difficult to factor in uniformly.

(d) Several financial incentives and tax concessions are available for WtE projects which may not be uniform across the projects. If these incentives are factored in while determining the tariff, the projects may become unattractive for the developers etc.

(e) The developers may use alternate fuel apart from MSW to supplement the generation. Pricing of fuel would pose problem.

(f) There are no norms/historical data available for tariff determination.

(iii) The other alternative approach for tariff determination for WtE projects would be based on marginal cost or avoided cost of generation, which are more academic in nature for WtE projects.

(iv) The Maharashtra Electricity Regulatory Commission (MERC) in its order dated 6.4.2004 has observed that efficient waste disposal is the responsibility of the Municipal corporation and the corporation is the beneficiary from the development of WtE projects with reduction in land fill requirements and environmental friendly disposal of waste and therefore the corporations should be responsible for all costs related to the project and these should not be passed on to electricity consumers through higher tariff. It has held that WtE plant could be considered as a captive power plant of the Municipal Corporation and since the captive generation concept cannot be used to allow Municipal Corporations to setup such captive plants under the provisions of the Electricity Act 2003, the Commission would allow distribution open access to Municipal corporations to facilitate wheeling of power from such WtE plants to the corporations.

MERC has decided in the said order that the project developers and the Municipal Corporations will mutually decide the tariff for the project and that the corporation will purchase the entire quantum of energy generated by the project for their own consumption with appropriate wheeling and banking arrangement with the concerned licensee. MERC has given certain guidelines for such tariff determination in the order. It
has also directed that in case of excess power being available, it will be the responsibility of the respective corporation to sell such excess power to the licensee and/or to a third party in competitive market. (Please see full text of the order dated 6.4.04 on MERC website www.mercindia.nic.in case No15/2002).

(v) In order to promote WtE projects, one other alternative would be to allow such project to sell power under open access to third party with concessional cross subsidy surcharge and reduced wheeling and banking charges. By doing so, the project developer would be free to determine his tariff depending upon the market conditions and the prevailing consumer tariff. This Commission has already determined the wheeling charges for NCE projects for own consumption as 5% of the input energy. This could be extended to third party sale also in order to promote WtE projects. However, with the existing level of high cross subsidy surcharge (113 paise per unit for 66 KV consumers and 83 paise for 33 KV level consumers) purchase by the third party from WtE projects may not be remunerative and therefore there is a need either to exempt the purchase from WtE projects from the cross subsidy surcharge completely or to reduce it substantially.

Considering all the various alternative approaches for tariff determination for WtE projects, the Commission tends to agree with the decision taken by MERC that the WtE projects should be treated as captive power plants of the Municipal Corporations. In view of various facilities that are extended by the Municipal corporations to the developers such as making available the required land, water supply, providing MSW either free or at nominal rates etc, and also because of various benefits that the corporations derive from such WtE projects both tangible and intangible, it would perhaps be better to leave it to the respective corporations and the developers to decide on the tariff mutually. In order to promote such projects, the Commission may extend the concessional wheeling charge of 5% determined for NCE sources for captive consumption to these projects also. Banking facility may also be extended to such projects free of charge to take care of mismatch between the generation schedule and its consumption especially since the street light load would come up only during night times, while the generation may take place through out the day.

In the view of the Commission, the other feasible alternative would be to allow the WtE projects to supply energy to third parties under open access with a concessional 5% wheeling charge, free banking charge and to levy 25 to 50% of the normal cross subsidy surcharge to such consumers under open access.

7. Comments invited

Considering all the above discussion, comments are invited from the stakeholders on the following:
(i) Whether the WtE projects should be treated similar to captive generation units and be allowed to supply power to Municipal corporations at the tariffs to be decided mutually between the two?

(ii) In the alternative, whether the WtE projects could be allowed to sell the electricity to third parties under open access with 5% wheeling charge on the energy input and free banking facility. Whether a concessional cross subsidy surcharge say 25 to 50% could be levied on such consumers under open access.

(iii) In case it is decided that the WtE projects shall supply electricity to the ESCOMs as in the case of other NCE projects, what should be the methodology to be adopted for such tariff determination? In view of complexities involved, can we adopt the MNES tariff with 5% annual escalation (simple) as has been done by APERC.

(iv) What are the other measures to be taken by the Commission to promote WtE projects?

Comments/views may please be provided to the Commission latest by 31.5.2006.