Agricultural Efficiency Program

The Agricultural Energy Efficiency Program will improve the end-use energy efficiency in the agricultural sector by changing pumping machinery through a joint effort of MSEB and MEDA using a variety of activities including promotion, training and capacity building of artisans in rewinding shops.

Background

Agriculture sector in Maharashtra contributes more than 20% electricity in the state with close to 10000 Million Units consumption annually. Tariff in this sector is Rs. 150/HP/year for regions where the electricity consumption is less than 1300hrs/HP/year and Rs. 180/HP/year where the electricity consumption is more than 1300hrs/HP/year. With issues related to depletion of ground water table, the agriculture pumping in the state of Maharashtra will be under higher stress. Average cost realization from the agriculture sector is 51% (MERC tariff order FY 2003-04). Agriculture sector also faces issues related to the time of supply of electricity to the farmers and social aspects linked with the night-irrigation. MSEB's measures linked to feeder segregation has also lead to distortion in the system due to illegal conversion of single phase to three phase supply with the phase converters. Adverse power factor as a result of non-standard pumping equipment and non-reliable supply voltage (with variations up to minus 30%) have resulted in system failure at the feeder and end-use. On an average, the pump-sets need to be rewound at least in a year resulting in higher cost factor inputs to the farmers. Frequent rewinding also results in inefficient pumping machinery used in the field, resulting in higher losses at the end use.

Several studies in the agriculture sector have indicated benefits at different levels:

- Higher end-use efficiency with energy efficient pump-sets, with wide-voltage variation motors
- Increased reliability of electricity distribution with potential to increase the number of pumping hours
- Energy savings potential of close to 20 to 25% is expected with the energy efficient pump-sets. Intermediation in this sector will not necessarily result in reducing peak demand as the current supply to this sector is in the non-peak hours.

Rationale

The Agriculture Energy Efficiency Program is targeted at improving the end-use efficiency by changing the pumping machinery through a joint effort by the MSEB and MEDA through a variety of programs ranging from promotion, training and capacity building of artisans in the rewinding shops.

Program Objectives

- Improve energy efficiency in the agriculture pumping operations
- Improve system distortions with power factor corrections
- Promote benefits of efficient pumping system among the end-users
- Demonstrate benefits of efficient pumping system by implementation of pilot projects
- Integrate efficient pumping program with other system improvement programs such as the high-voltage distribution system

Program Design

Electricity is the most important constituent of the infrastructure. It has been observed that the running power factor of agricultural pump is very low due to which it increase the demand of electricity and also leads to increase energy losses. There are approx. 24 lakhs agricultural pump connections in the state. By installation of the capacitors on agricultural pumpset will be

definitely reduce reactive power requirement of the system. Hence by proper selection and subsequently improving power factor following benefits can be seen-

a) Reduction in current drawn
b) Reduction in cable losses
c) Reduction in transformer losses
d) Improvement in voltage regulation
e) Saving in KVA demand

Issues related to capacitor-

a) Proper selection of capacitor rating
b) Life of the capacitor
c) Maintenance of capacitor
d) Monitoring of power factor

Suggestions-

- Utility may implement one pilot project in two three feeders where no. of agricultural pumps are predominant
- Utility may thought off taking the help of trained Technicians from Industrial Training Institutes to install, maintain the capacitors on agricultural pump set and also make them responsible to maintain power factor at respective feeder level.
- Utility should take care of all the expenses for procurement of capacitors, cost for installation, annual maintenance and monitoring of the project.
- As the facilitating and implementing agency, MEDA will carry out the following activities:

- Collect feeder-base data on installed number of pump-sets in MSEB distribution circles
- Carry out representative energy audits in MSEB service area targeted at understanding the end-use efficiency levels and its impact on the MSEB system
- Facilitate designing of better standards and codes for agriculture pump-sets targeting lower losses, ability to function in the wide-voltage situations and improving power factor at the feeder and system level
- Conduct joint awareness campaign with MSEB in the rural sector to promote efficient pump-sets
- Design pilot projects targeted at demonstrating the benefits at the end-use and feeder levels
- Assist in implementation and monitoring of pilot projects and disseminate results to other distribution circles as a part of joint promotional campaign
- Design and conduct training programs for mechanics in the rewinding shops
- Analyze fiscal impacts of in-efficient agriculture pumping

Promote investments in agriculture pumping system by MSEB taking advantage of existing and new micro-credit channels

Target Market Segments - Agriculture sector

End Uses Targeted - Water pumping in the agriculture sector

Key Barriers Addressed

The following are the key barriers that will be addressed to improve energy efficiency in agriculture sector:

- Insufficient data on existing energy use pattern
- Gaps in the technical design of agriculture pump-sets that results in feeder imbalance
- Lack of trained mechanics at the re-winding shops in the rural sector

- Lack of cash-flow in the agriculture sector to improve end-use efficiency

Technologies to be Employed
- Wide-voltage motors in the pumping system
- Power factor correction units (capacitors) integrated with pump-set design
- Winding techniques

Financing Approach
2% of energy bill of agricultural pump set which is kept aside for energy conservation measures as per the MERC order may be utilize to fund this program.

Anticipated Results
- With a target of 100,000 pump-sets converted to energy-efficient pump-sets, this program is expected to save 800 Million Units in the first two years
- Changing of the pump-sets will result in higher level of savings spread over the next five to ten years
- Awareness building will increase the minimum performance standards of agriculture pump-sets to a greater level leading to perpetual benefits
- Program will result in capacity building of at least 2000 to 3000 artisans involved in the re-winding business

Program Benefits
- Reduction in demand
- Reduction in subsidies power
- Reduction in T&D losses

Institutional Relationships
Institutional relationships will be required with the following entities:
- MEDA
- Maharashtra State Electricity Board
- Maharashtra Finance Department
- Maharashtra Agriculture Department
- Industrial Training Institute / other academic and research institutions
- National Bank for Rural Development/Other micro-credit organizations

Key Action Steps

Developing database of agriculture consumption
MEDA shall collect information from MSEB on feeder connected load, load profile and pump-census. MEDA shall collect information from various sources (including equipment manufacturers/suppliers, results of energy efficiency studies under this program/other parallel and prior projects.

Designing pilot programs
MEDA shall identify sub-stations in consultation with MSEB and initiate audits targeted at generating feeder-level load profile and efficiency data. Based on the results from 5 to 7 audits conducted in different geo-climatic zones in the state, MEDA shall propose pump replacement program with emphasis on system efficiency improvement at the feeder implemented directly by MSEB under other Ministry of Power programs such as APDRP/DRUM.

Marketing and awareness campaign
MEDA shall initiate a marketing and awareness campaign in collaboration with MSEB through a variety of channels:

- Sensitization workshops
- Documentation of "best practices" in agriculture pumping
- Site visits
- Instituting an award for "most efficient feeder" managed and maintained by agriculture co-operatives

Identifying value chain for micro-credit
MEDA shall communicate with different co-operative and micro-credit banking institutions to establish the points of influence. MEDA shall also organize focused group meetings to develop a plan to pass on the MSEB funding directed at purchasing efficient pump-sets

Training and capacity building of mechanics at re-winding shops
MEDA shall assess the current knowledge of mechanics working at the re-winding shops and develop a comprehensive training plan with participation from technological institutions and winding material suppliers in the state.