For Further Details Contact:

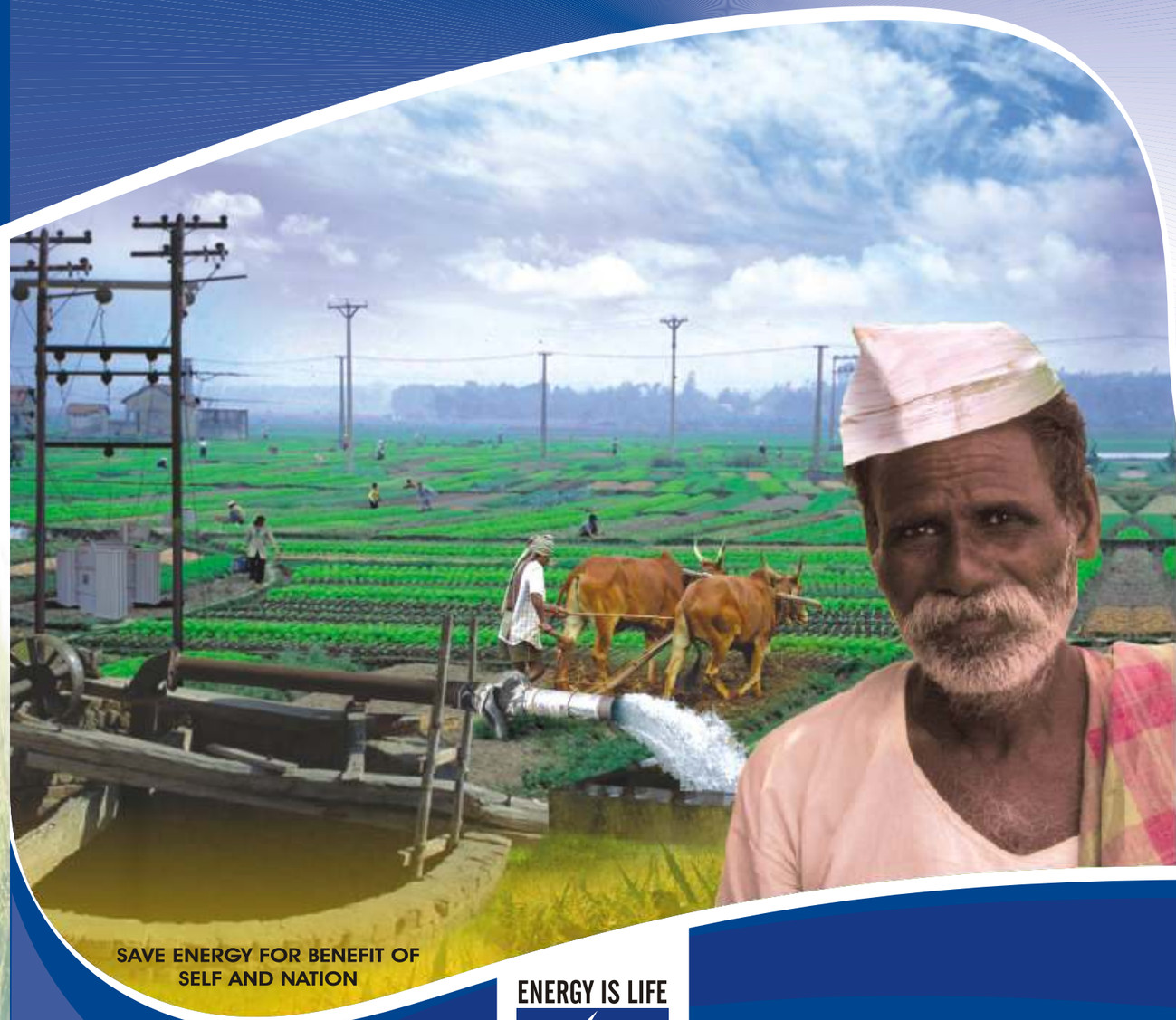
Bureau of Energy Efficiency (BEE)

(Ministry of Power, Govt. of India)

4th Floor, Sewa Bhawan, R.K. Puram, New Delhi-110 066

Website : **www.bee-india.nic.in, http://beeindia.co.in**

BEE Agricultural Demand Side Management Programme



SAVE ENERGY FOR BENEFIT OF SELF AND NATION

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Introduction

Bureau of Energy Efficiency (BEE) is a statutory body under Ministry of Power, Government of India. The mission of BEE is to institutionalize energy efficiency services, enable delivery mechanism in the country and provide leadership to energy efficiency in all sectors of the country. The primary goal of the Bureau is to reduce the energy intensity in the economy.

The broad objectives of BEE are as under

- To exert leadership and provide policy framework and direction to national energy conservation and efficiency efforts and programs
- To coordinate energy efficiency and conservation policies and programs and take it to the stakeholders
- To establish systems and procedures to measure, monitor and verify energy efficiency results in individual sectors as well as at a macro level
- To leverage multi-lateral and bi-lateral and private sector support in implementation of Energy Conservation Act and efficient use of energy and its conservation programs
- To demonstrate delivery of energy efficiency services as mandated in the EC bill through public-private partnerships
- To interpret, plan and manage energy conservation programs as envisaged in the Energy Conservation Act

The Bureau would obtain inputs and co-opt expertise from private sector, non-governmental organisations, research institutions and technical agencies, both national and international, to achieve these objectives.

Amongst other programmes, Agricultural Demand Side Management (Ag DSM) programme is a key thrust area of BEE to reduce overall power consumption and, indirectly, to reduce peak demand. This booklet has been designed to give an overview of India's agricultural sector, key issues in implementing Ag DSM projects and the actual status of the programme.

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Overview

Agriculture is one of the most important sectors of Indian economy. Agriculture and allied sectors accounted for 17.5% of the GDP in 2007-08 and employed more than 50% of the total workforce. Agriculture plays a significant role in the overall socio-economic development of India. Agricultural sector consumes 22% of total electricity consumption (Figure 1).

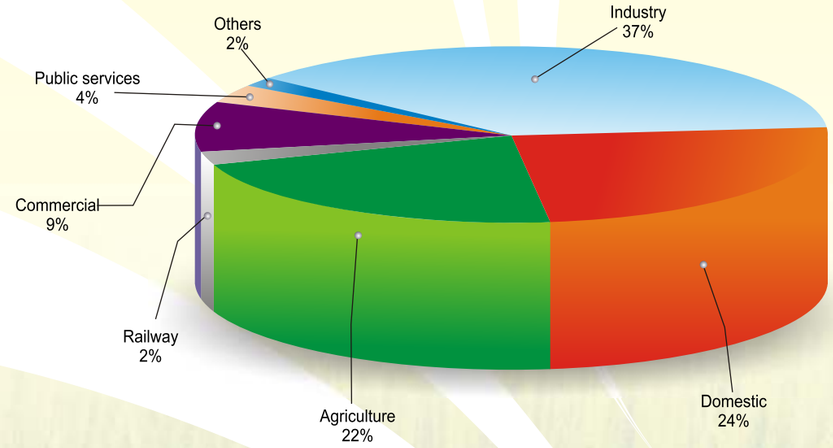

Figure 1 : Electricity consumption (in percentage) in different categories in 2006-07
Source : Energy, CMIE (Nov. 2008)

The power consumption pattern in agriculture sector witnessed an increase from 4470 million units during 1970-71 accounting for 10.21% of total power consumption, to 99023 million units during 2006-07, accounting for 21.7% of the total consumption (Figure 2). The high rate of growth in agricultural electricity consumption results from aggressive rural electrification coupled with a policy of below cost pricing to farmers. The agricultural tariff has not grown while average cost of supply of utilities is increasing at a fast pace. It has been one of the factors contributing to inefficiencies and thereby high AT&C losses of the state utilities.

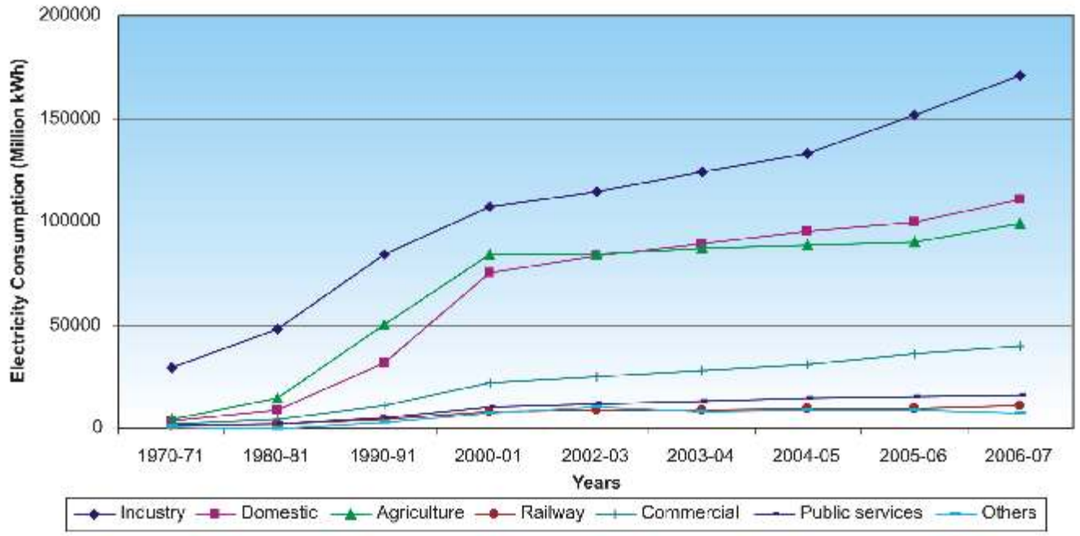

Figure 2 : Consumption of electricity , by sectors, in India (1970-71 to 2006-07)
Source : Energy, CMIE (Nov 2008)

The rural agricultural supply is characterized by the following

- Low reliability due to high cost of service and low or no revenue;
- Use of inefficient pumps by farmers due to lack of incentives, given the low or no cost power supplied;
- The average extraction of water by such pumps is less than half that of China and is about 1.8% that of USA. This is despite the fact that the numbers of installed ground water extraction pumps / tube wells are (at 20 million) the highest in the world; and
- The unsustainable growth rate, low prices inevitably lead to a high subsidy burden on states, estimated at about Rs. 40,000 crores (Economic Survey, 2006-07).

Opportunity

Ag DSM promises immense opportunity in reducing the overall power consumption, improving efficiencies of ground water extraction and reducing the subsidy burden on the States without sacrificing the service obligation to this sector. In terms of electricity saved, given that most of the studies project potential savings of about 30% by mere replacement of inefficient pumps, the overall electricity savings (from 15 million pumps) is estimated at 30 billion units annually.

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Dimensions of the Challenge

The simplistic replacement methodology of inefficient pumps by efficient one is fraught with many practical impediments.

(1) **Technological :** The desired working of efficient pumps is contingent upon a reliable power supply; else the promised output may not be available. A reliable distribution network, like HVDS, in rural area becomes of dominant interest. In addition, supply chain of efficient pumps and adequate maintenance expertise of such pump sets in rural areas are the associated issues linked to the technology intervention.

(2) **Economic :** The initial capital cost of efficient pump is high. Given the lack of incentives of the farmers on conservation of electricity, the first cost bias enhances the barrier. Concomitantly, the low or no cost of electricity and uncertain availability of government subsidy does not enthuse the Utilities either to step up efforts towards upgradation of rural distribution network.

(3) **Analysis of location specific baseline :** Potential savings are location-specific requiring adequate up-front analysis, extensive inspection, measurement and analysis of the existing stock of pump sets, etc. Significant amounts of data collection are necessary to set a baseline to measure whether benefits were achieved and sustained. Measuring success often requires data on the number of acres under irrigation, total rainfall, cropping patterns, the type of irrigation (e.g. flood vs. drip) and other factors that influence the need for water and, thus, the amount of electricity used.

(4) **Monitoring :** This perhaps reflects the greatest concern in effective implementation of the Ag DSM. This is because of the following reasons:

(i) Lack of incentives of farmers and Utilities

(ii) The quantification of results requires metering, which in the present regime of subsidy, is not likely to be implemented

(iii) Lack of awareness and information as well as low appreciation of the need to conserve water and electricity for sustainability.

(5) **Tragedy of Commons:** A "tragedy of the commons" occurs when property rights over a productive asset are ill defined or cannot be enforced. Thus, even if all the pump sets are replaced, after setting the necessary baseline water requirements, absence of incentives diffuse the rights and obligations of its use. Several pilots have, after an initial success, failed to sustain in the medium or long run due to inability of organizing collective action to harness reckless proliferation of private good in the area.

(6) **Risks:** The above challenges inevitably enhance the risks associated with it and thereby preventing private investment on the performance contracting pay back model. The risks that need to be ring fenced are:

(a) **Monitoring risks :** Due to absence of standardized and verifiable protocols for monitoring, lack of incentives of key stakeholders, etc.

(b) **Commercial risks :** Due to lack of adequate financing, high upfront investment, uncertain revenues and risk mitigated instruments (like ESCROW).

(c) **Political risks :** The political economy of the agricultural sector poses a huge risk particularly in metering of feeders, individual pump sets. Lack of collective action at the farmer level adds to this risk.

(d) **Regulatory risk :** Due to absence of regulatory incentives, oversight and uncertainty over favourable policy (if any).

Approach

A successful implementation model must address all the above variables. In order to do so, the engagement of stakeholders must be enlarged to address all the issues mentioned above. The key stakeholders that need to be engaged are:

(a) State Governments
(b) Ministry of Power
(c) Bureau of Energy Efficiency
(d) Ministry of Water Resources
(e) One or more Financial Institutions (e.g. PFC)
(f) Electricity Distribution Companies
(g) Farmers or Farmers Group
(h) Energy Services Companies (ESCOs)

Ag DSM - Subsidy Linked Holistic Approach

- Engagement of all stakeholders
- Assess potential savings of electricity and water
- Create incentives for farmers as well as the State utility
- Analyze and plan the implementation of efficient pumps
- Conduct load research and establish a base line
- Provide a suitable subsidy linked funding mechanism with due incentives for an appropriate Public Private Partnership (PPP) model to work.
- Provide sufficient measures to ring fence all the risks associated with such projects.
- Encourage measures that create awareness and education amongst farmers.
- Harness the collective action amongst local farmer community to diminish the effects of the free riders.

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The stakeholders need to work together to ensure that the plethora of variables is captured in a manner that provides sustainable solution. The business model of Ag DSM project is shown in Figure 3.

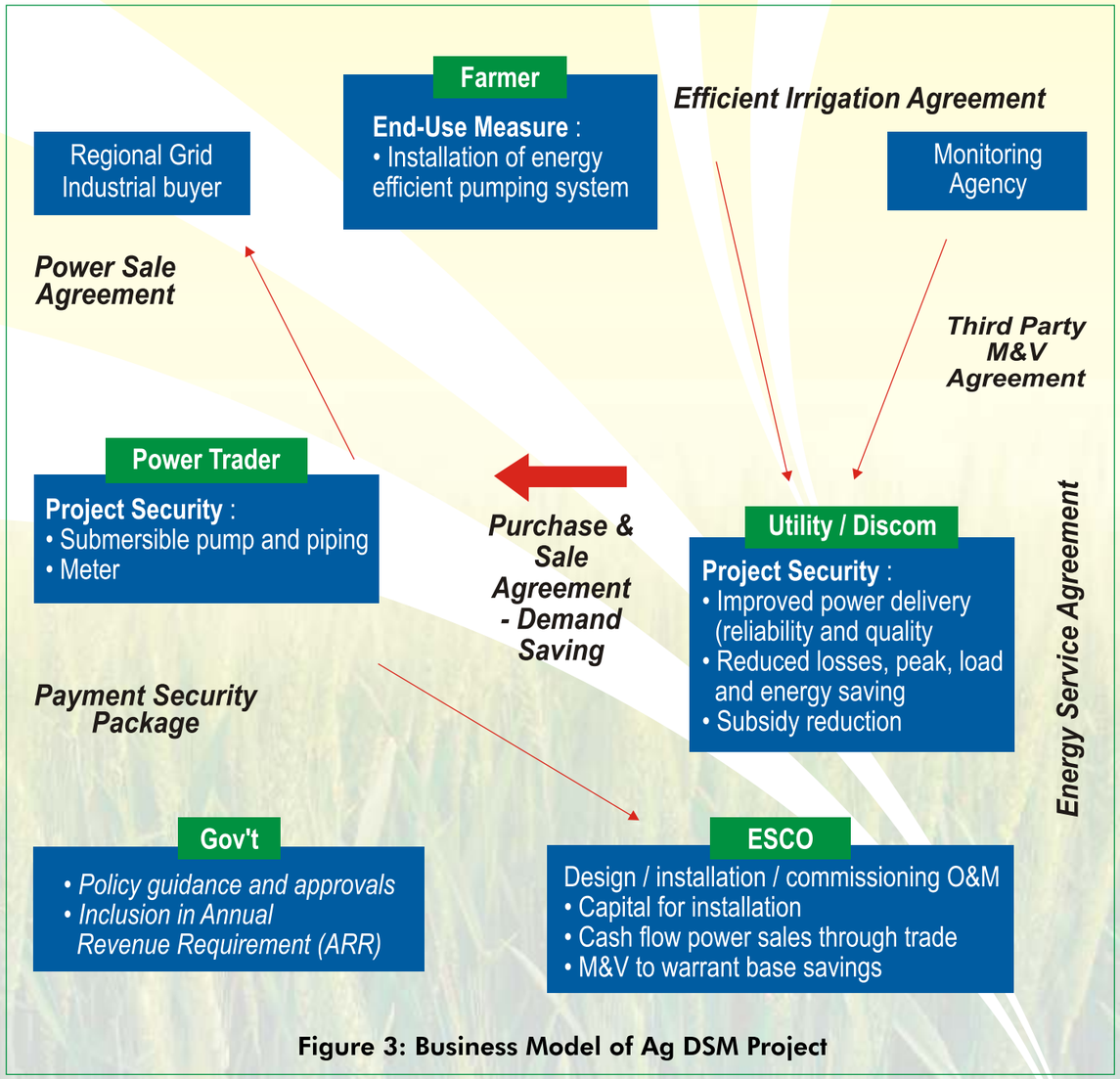

Figure 3: Business Model of Ag DSM Project

Ag DSM Programme

In order to accelerate DSM measures in agriculture sector, BEE has initiated an Ag DSM programme in which pump set efficiency upgradation would be carried out through Public Private Partnership mode. The objective of the programme is to create appropriate framework for market based interventions in agricultural pumping sector by facilitating conducive policy environment to promote Public Private Partnership (PPP) to implement the projects.

The intended outcomes of the programme are

- Business model linked to subsidy reduction
- Shelf of bankable DPRs to be prepared to stimulate the market
- Baseline development, conducive regulatory regime and security mechanism being worked out
- Awareness and outreach to local farmers and utility employees
- Risk mitigation measures to encourage PPP being evolved
- CDM benefits for the scheme being put in

Under this programme, an Energy Service Company (ESCO) would invest in energy efficiency measures on a rural pump set feeder on which supply quality enhancements [such as High Voltage Direct Supply (HVDS)] have already been carried out. The intervention would lead to lower energy supply on the feeder, and hence, could result in lower subsidy to be paid by the State Government. Part of the savings in the subsidy would be paid to the ESCO on an annual basis to pay for their investment in pump set upgradation.

To ring fence the payment security mechanism, large Financial Institutions may be brought in to provide loan to the project as well as adequate payment security mechanism to the investors. Utilities will play the important role of Monitoring and Verification. Government, through BEE is providing resources to create a shelf of bankable DPRs in the agricultural sector to mainstream the scheme.

Steps involved in implementation of Ag DSM Project

- Identification of Districts, Sub Divisions of State for Engagement: The objective of this task is to rank districts and sub-division of a State based on a framework and to shortlist/identify most preferred districts for initial engagement and DPR preparation.
- Identification and selection of Feeders for DPR Preparation: The objective of this task is to identify eligible feeders for DPR preparation based on size, HVDS, adequate number of pump sets, measurable baseline (feeder and pumpset level metering), and availability of baseline data.
- Preparation of RFP for DPR preparation (sample template can be downloaded from BEE website)
- Engagement of Consultants for DPR preparation
- Organisation of Workshops and Seminars for Awareness Generation and Capacity Building for farmers and utility employees in areas where DPR is being developed.
- Risk Mitigation Measures for Ring Fencing of Risks in Ag DSM Projects
- Develop a model for implementation of the project
- Engagement of ESCO for implementation of DPR

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Current Status of Ag DSM Programme

- A detailed questionnaire was developed to collect data from various states. It covered data like total number of consumers, total load, total revenue generation, number of agricultural consumers, total agricultural load, revenue from agricultural consumers, number of feeders and status of separation of agricultural feeders, etc.
- Meetings were held with CMDs of various Discoms/Utilities to inform them about the project and to collect data as per the questionnaire.
- A framework was developed to rank States with a view to select most preferred States for implementation of agricultural DSM projects. A total of six attributes as listed below were chosen to select the States.

  a) Total connected load

  b) Share of energy consumption in agricultural sector (%)

  c) Status of feeder separation

  d) Aggregate Technical and Commercial (AT&C) loss (%)

  e) Overexploited ground water situation (%)

  f) State power sector performance rating
- Based on an above framework, following 5 States were selected for implementation of Agricultural DSM in phase-I of the programme :

  a) Maharashtra

  b) Gujarat

  c) Rajasthan

  d) Haryana

  e) Punjab
- Meetings were held with nodal officers/CMDs in the selected States to identify district/sub-division and select segregated feeders having HVDS system for DPR preparation.
- Maharashtra, Rajasthan and Gujarat have identified the feeders and provided the required data for DPR preparation.
- A Request of Proposal was prepared and sent to energy auditors/ESCOs for carrying out energy audit and prepare a detailed project report.
- First pilot Ag DSM project is being launched at Solapur district in Maharashtra.
- BEE in consultation with Maharashtra State Electricity Distribution Company Limited (MSEDCL) identified 4 feeders (covering approximately 2000 pumps) in Mangalvedha sub-division of Solapur district for implementation of pilot Ag DSM project.
- The intent of the pilot is to demonstrate the technical viability of the approach and to confirm that the ESCO model is workable.
- BEE has selected the agency that will conduct energy audit of all the pumps and prepare DPR.
- BEE has labelled agriculture pump sets
- BEE has accredited 35 ESCOs through an accreditation process carried out by CRISIL and ICRA.
- A diagnostic study of available approved CDM methodologies for agriculture pump-sets efficiency improvement vis-à-vis available data from DSM studies has been conducted.

Way forward

- Workshops would be organized for farmers and utility employees in areas where DPRs are being developed
- Brain storming sessions would be organized on issues related to Agricultural DSM and energy efficiency of pump sets with agriculture cooperatives, energy auditors and ESCOs, pump set manufacturers and equipment suppliers, regulators and utility.
- Local specialists would be trained in maintenance and repair of energy efficient pump sets
- Ag DSM DPRs for pilot projects in other selected states would be prepared
- Risk mitigation measures for ring fencing of risks in Ag DSM projects and performance contract for ESCO would be prepared
- Implementation of DPRs would be carried out through ESCO mode.


Launch of
Agricultural Demand Side Management (Ag DSM) Pilot Project
A visionary initiative to power agriculture with an energy-efficient thrust
Inauguration
of
Ag DSM Pilot Project at Solapur, Maharashtra
by
Shri Sushilkumar Shinde
Hon'ble Union Minister of Power
Sunday, 1st February 2009 at 11.00 A.M.
Benefit to farmers
Free high quality new pumps will be given.
Cost of each new pump is about Rs. 35,000/-.
Power consumption will reduce.
Lower maintenance cost of new pump.
No rewinding problems.
Reduced time for pumping same quantity of water.
Water level will be maintained.
Better power supply quality.
Dr. Manmohan Singh
Hon'ble Prime Minister of India
Smt. Sonia Gandhi
Hon'ble Chairperson, UPA
Shri Sushilkumar Shinde
Hon'ble Union Minister of Power
Shri A. S. Chavan
Hon'ble Chief Minister, Maharashtra
Shri Jairam Ramesh
Hon'ble Union Minister of State for Power
Shri Sunil Tatkare
Hon'ble Energy Minister, Maharashtra
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MAHAVITARAN
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