

Presentation on
**Scope for Distribution Improvement
in
Agricultural Sector**

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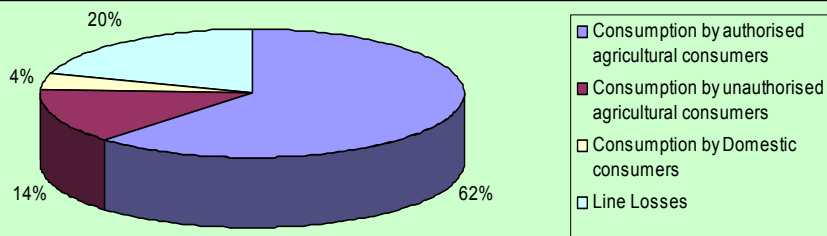
All India Statistics

- Power Consumption - 427 Billion Units
- Number of Pumpsets - 12.2 Million
- Energy Consumption - 30%
- Revenue Realized - 3.5%
- T & D Loss - 20 to 25%
- Average Pumpset efficiency - 20 to 25%

Gubbi substation

- Substation – 30 MVA 110/11 kV
- Number of feeder - 13 (1 town & 12 agricultural)
- Number of Pumpsets – 8,000
- Number of Consumer - 20,000
- Energy Consumption - 95 MU/ annum
- Revenue Realized - 4%
- T & D Loss - 25 to 30%
- Average Pumpset efficiency - 20 to 25%

Energy Balance Statement	MU	%
Consumption by authorised agricultural consumers	59	62%
Consumption by unauthorised agricultural consumers	13	14%
Consumption by Domestic consumers	4	4%
Line Losses	19	20%
Total energy sent out from substation	95	100%



3EC's Findings on Utility's Operation

- Unplanned Development
- High T & D Losses
- Improper Load Distribution
- Long Distribution lines in TREE like Structures
- Overloading of Feeders & DTC's
- Poor Voltage Conditions & Power Factor
- Power Pilferage
- Low Revenue Generation
- High Transformer Burnout rates

TYPICAL AGRICULTURAL PUMP

TYPICAL PUMPING SYSTEM AUDIT

3EC's Findings on End User Problems

- **Poor quality & reliability of power supply**
- **Restricted availability of power with out considering field requirements**
- **Frequent interruptions**
- **Frequent Burn outs of Motors due to poor voltage conditions – 2.5/year/pump**
- **Inordinate delay in replacing burnt out Transformers**
- **Use of Inefficient/Non-standard equipment**
- **Poor quality of workmanship in rewinding work**
- **Ignorance towards maintenance practices**

3EC's Findings on Pumping System & Water Table

- Uncertainty of supply forces overuse of pumps by farmer
- Poor quality of water delivery systems resulting in heavy losses
- Hence, In-efficient use of water resources
- Depletion of water table
- Yield gets affected

Energy Efficient Pumps

- Well designed pumps are normally 6-8% more efficient than ordinary Pumps
- An efficient pump saves considerable costs even if the initial costs are higher than an ordinary pump.
- Typical payback periods are less than 3 years compared to ordinary pumps

Why Use Energy Efficient Pumps?

Example: Centrifugal Water Pump

Particulars	Ordinary	Efficient
1 Annual Operating Hrs	6000	6000
2 Efficiency	0.6	0.7
3 Theoretical Power (KW)	10	10
4 Actual Power	16.66	14.29
5 Discharge (m ³ /min)	3	3
6 Head (mt)	20	20
7 Energy Consumption	100000	85714
8 Cost of Energy (Rs/yr)	250000	214285
9 Investment	18000	25000
10 Cost Ratio of energy/pump	13.89	8.57
11 Energy Saving(Rs/yr)	--	35715
12 Payback Period (Yr)	--	0.7

Calculations

Actual Power required (kW)	
= 10/0.7	= 14.29
Energy Consumption (kWh)	
= 14.29 x 6000	= 85714
Cost of Energy (Rs/yr)	
= 85714x2.5	= 214285
Cost Ratio Energy/Pump	
= 214285/25000	= 8.57
Energy Savings (Rs/yr)	
= 250000 - 214285	= 35715
Payback Period (yr)	
= 25000/35715	= 0.7

Assumptions: Operating hr. 6000, constant head & discharge, Energy Rate Rs. 2.5/kWh

Investment for EE Pumps

Number of Pumpsets to be replaced	2,700 Nos
Unit cost Pumpsets (Supply & Installation)	20,000 Rs.
Investment for Replacement of Pumps	54.0 Million
Miscellaneous costs	5.4 Million
Implementation costs	4.75 Million
Total Investment for EE Pumps	64.15 Million
Grand Total - Investment for Upgradation	235.37 Million

Calculation of Energy Savings

Number of Pumpsets replaced	2,700 No.'s
Pumpset Rating	5 HP
Total Pumpset Load (modified)	25,177.5 kW
Total Pumpset Consumption (modified)	60.4 MU
Line Loss (Modified)	4.8 MU
Total Demand (modified)	65.3 MU
Energy Savings	25.3 MU
Cost of Energy Saved	75.75 Million
Financial Analysis	
Total Investment	235.373 Million
Annual Savings	75.75 Million
Payback	3.11Years

Payment Methodologies

- ❖ First 6 years all the savings will be paid to the Investor or until investment with returns is realised
- ❖ After 6 years the system will be transferred to KPTCL

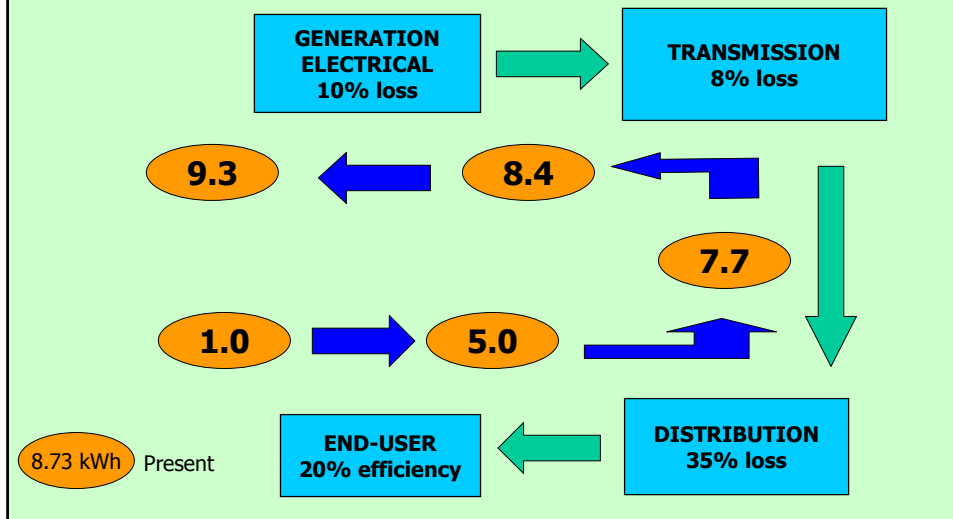
E.E Case study - Rural sector

For one pumpset irrigating 5 Acres

	Present	Proposed
• Flood irrigation system	system	system
• Average rating	5 kW	2.5 kW
• Average efficiency	20 %	40 %
• Annual operating duration	1500 hours	1500 hours
• Energy consumption/Year	7500 kWh	3750 kWh
• Water Consumption	10,800 kL/Year	10,800 kL/Year
• Area for cultivation	5Acres	5Acres
• Crop	Arecanut	Arecanut
• Number of plants	650	650
• Head	80 Metres	80 Metres

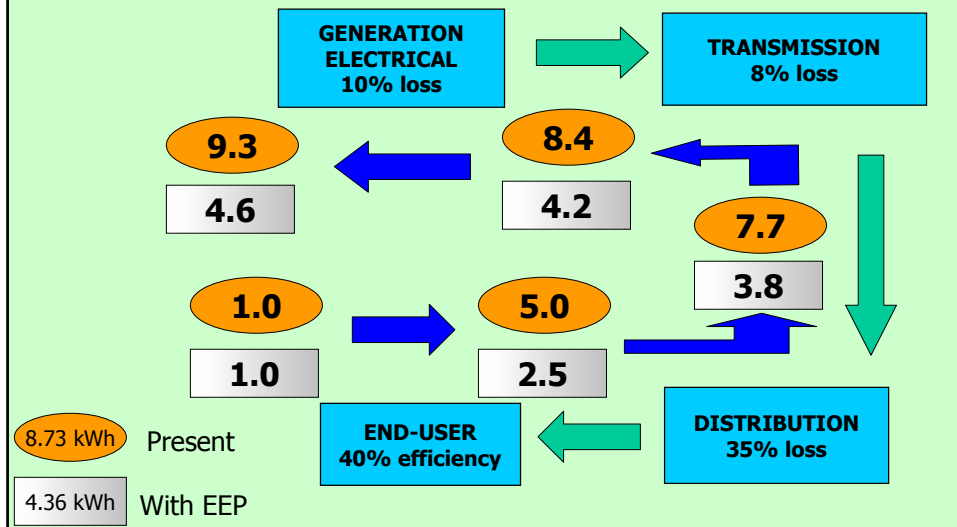
Present System

All Values in kWh



EEP Vs. Present System

All Values in kWh



Economics

Indicator	EEP
• Investment (Rs.)	40,000
• Power Savings (kW)	2.5
• Energy Savings (kWh/Year)	3,750
• Simple Payback (Yrs)	3.6
• Water Consumption (kL/Year)	10,800*

* Flood irrigation

Conclusions

- End-use efficiency improvement is the first solution for an inefficient system
- Drip irrigation system will be attractive if water costs are considered
- Drip irrigation saves a lot of water which can be used for additional irrigation

The CDM Angle

Checklist concerning additionalities & Imp. Criteria

- | | |
|--|--------------------------|
| • Financial additionality | YES |
| • Technical additionality | NO |
| • Technology Transfer
(Run of the Mill Equipment) | NO |
| • Sustainable development
and social fairness | YES (Definitely) |
| • Poverty Alleviation | YES |
| • Relevant for Sustainable
Country development | YES (Very High priority) |

The CDM Angle

Checklist concerning additionalities & Imp. Criteria

- Will sale of CER at US \$3 to US \$6 improve project revenues much MARGINALLY
- Repeatability & Market for Measure YES(Huge)
- Foreign Investment flow to India NO (Unilateral project type)
- Additional to what would have happened anyway YES(Definitely & Obvious)

Summary of Financial Analysis

Parameter	Without CDM	With CDM
Investment	471 Million Rs.	471 Million Rs.
IRR – Project	20 %	22 %
DSCR	2.13	2.36