ENERGY CONSERVATION AND EFFICIENCY

DSM Policy Initiatives in India

BUREAU OF ENERGY EFFICIENCY
NEW DELHI
(Ministry of Power)

Saurabh Kumar, Secretary
18th April 2007
Seoul

OVERVIEW

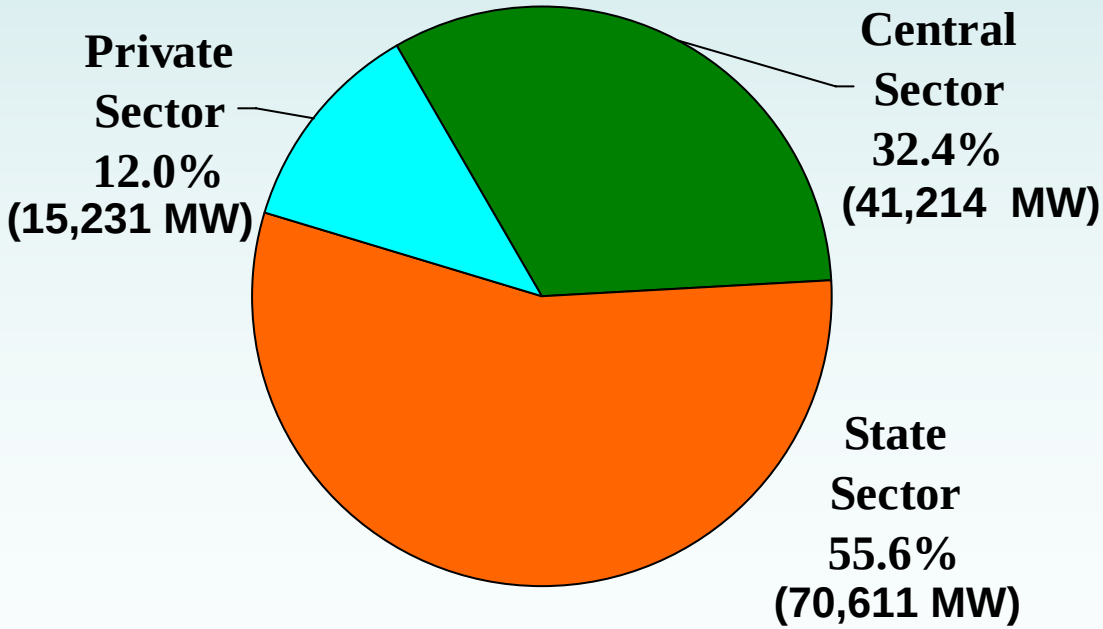
- Indian Power Sector Profile
- Energy Conservation Act, 2001
- Trends in Energy Efficiency and Conservation in India
- Barriers to EE/ EC
- Regulatory Interventions
- Programmes for EE/ EC promotion
- DSM Initiatives in India
- Agricultural DSM

INDIAN POWER SECTOR

- Power in concurrent list of Constitution
- Both Central and State can legislate - Central law prevails in the event of conflicting provisions
- India has been able to achieve an economic growth rate of 8% per annum during last few years.
- Targeting an economic growth rate of 9-10% per annum.

INSTALLED GENERATING CAPACITY

Generating Capacity		
	Hydro	33,193 MW (26%)
	Thermal	83,772 MW (66%)
	Coal	68,989 MW
	Gas	13,582 MW
	Nuclear	3,900 MW (3%)
	Renewables	6,191 MW (5%)
	TOTAL	1,27,056 MW



In addition captive generation capacity of appx. 41,000 MW.

ENERGY IS LIFE
BEE
CONSERVE IT

GROWTH OF POWER SECTOR

CENSUS RESULTS	1996-97	2006-07*
PLF (%)	64.4	76.2
Energy Shortage (%)	11.5	9.2
Peaking Shortage (%)	18.0	14.2
Households Access to Electricity (%)	42.0	56.0
Rural Households Coverage (%)	31.0	43.8

** Upto February, 2007*

REDUCING ENERGY REQUIREMENTS

Energy Intensity : comparative status

Country	Energy Intensity (KgOE/ $ GDP PPP)
India	0.16
World Average	0.21
China	0.23
US	0.22
Germany and OECD	0.17
Denmark	0.13
Brazil and Japan	0.15

POWER SECTOR DEVELOPMENT

OBJECTIVE

- Sufficient power for 9-10% growth
- Reliable power
- Quality power
- Inexpensive power
- Commercial viability
- Power to All

STRATEGY

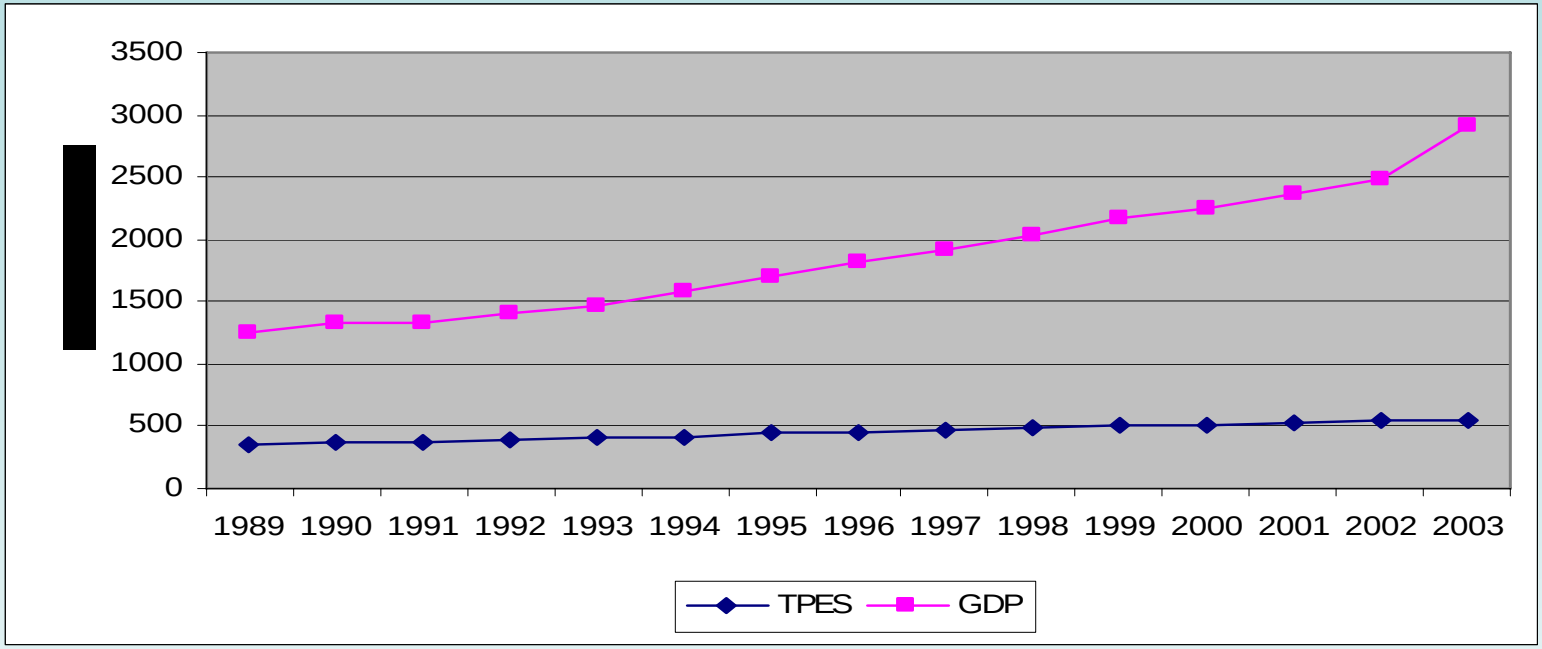
- Generation
- Transmission
- Distribution
- Rural Electrification
- Conservation
- Regulation
- Financing
- Legislative
- Communication

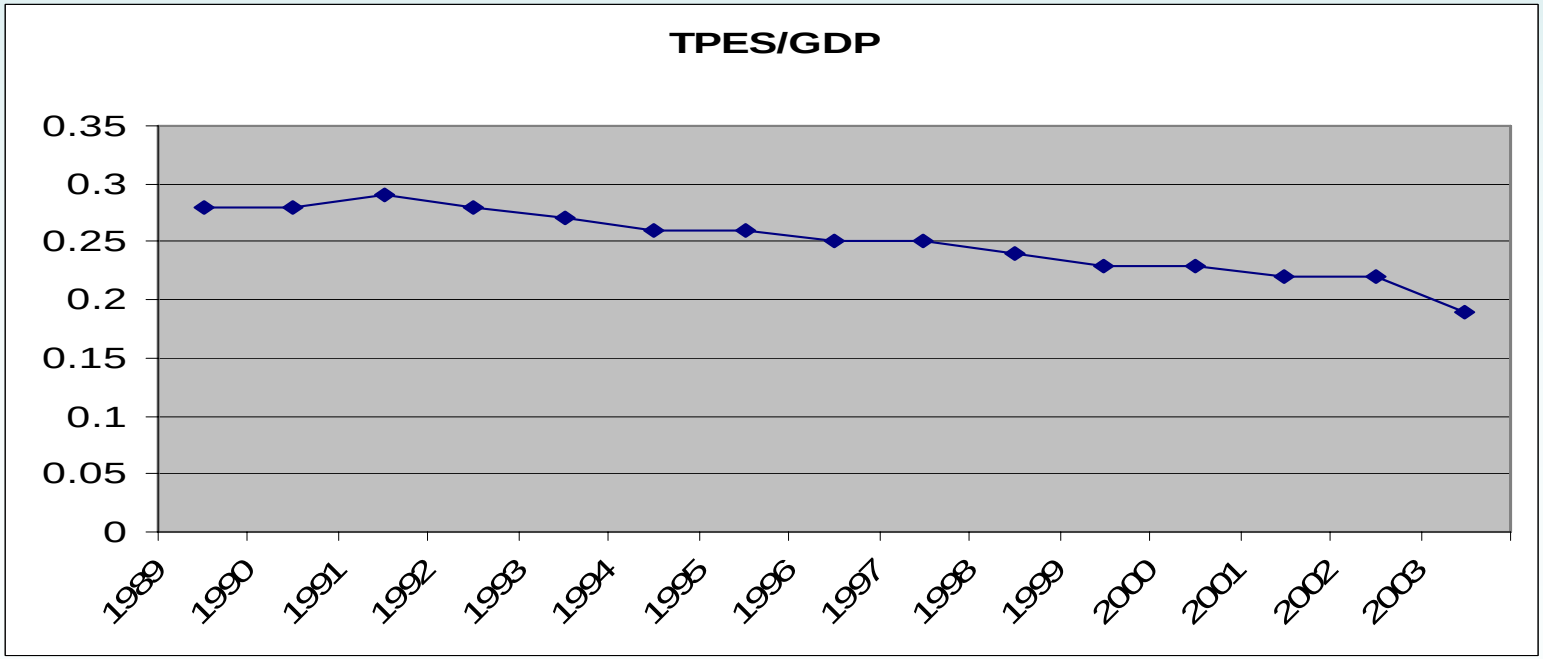
ACTION

THE ENERGY CONSERVATION ACT 2001

- Energy Conservation Act, enacted in October 2001. BEE created as the nodal statutory body to improve energy efficiency through:
  - Standards and labeling for appliances
  - Energy Conservation Building Codes
  - Energy consumption norms for Designated Consumers
  - Certification and accreditation of energy auditors and energy managers
  - Dissemination of information and best practices
  - Capacity Building
  - Establish EE delivery systems through Public-Private Partnerships
- The Act creates the Bureau of Energy Efficiency (BEE) in the centre, and State Designated Agencies (SDAs) in the states
- 30 states have created SDAs

INCREASING ENERGY EFFICIENCY

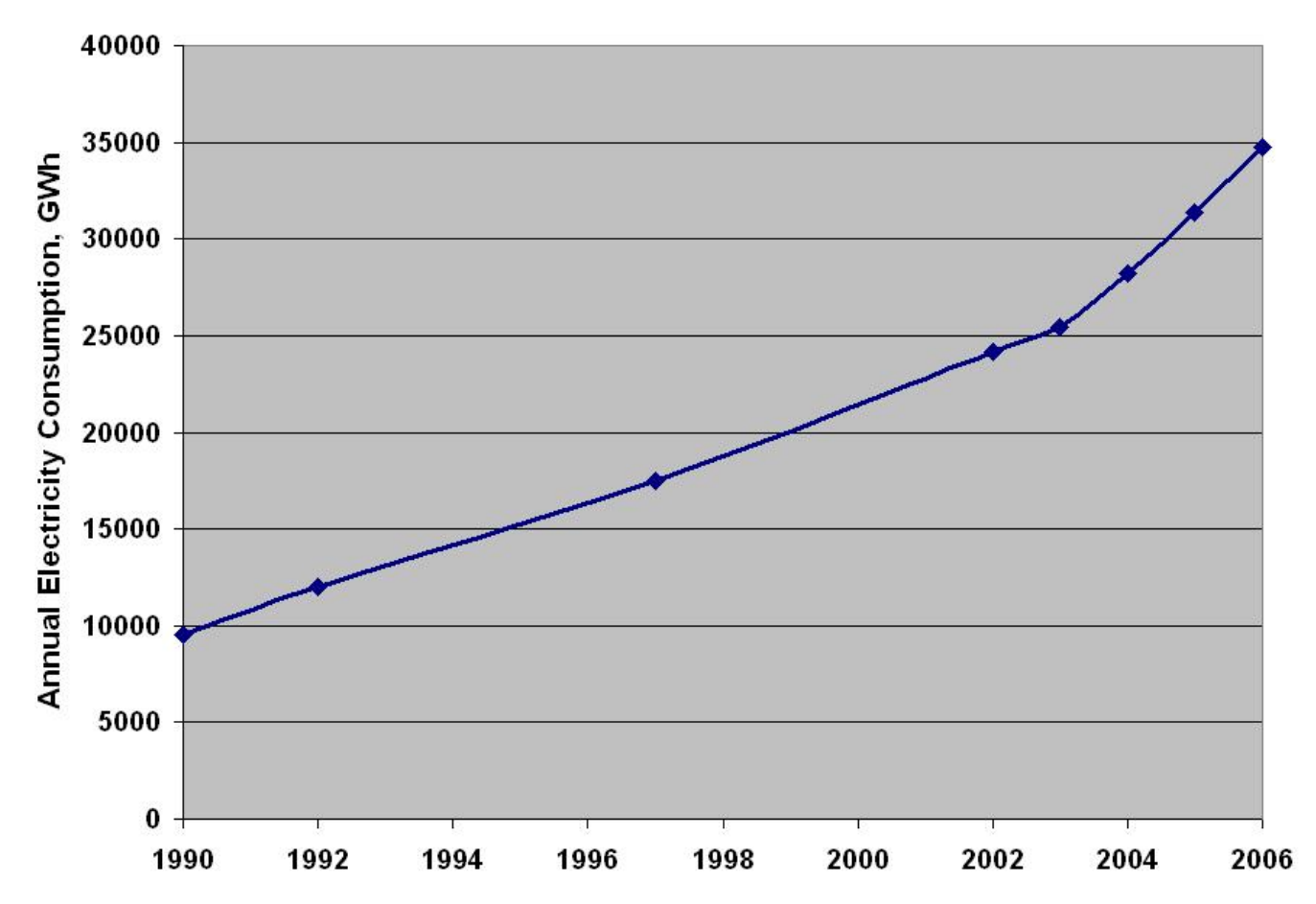




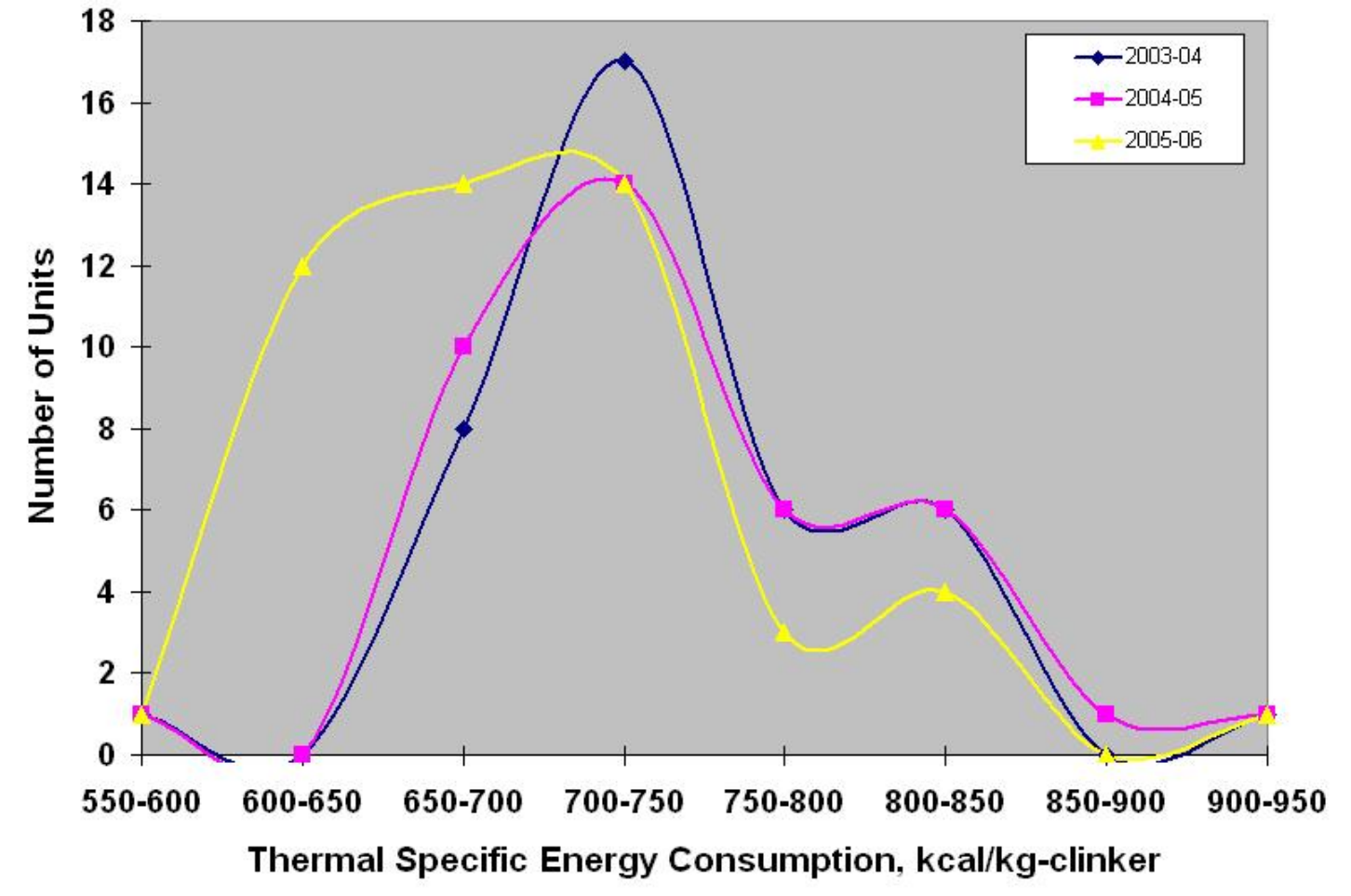
Energy use transitions hold key to future trajectory

- Household energy mix is rapidly moving from inefficiently-utilized biomass to gas and electricity
- Commercial space is increasing; and energy use is commercial space is increasing at a faster pace
- Industrial energy intensity is declining, but there is a wide bandwidth of specific energy consumption within industrial sectors

Electricity Use in the Commercial Sector is increasing



Energy Intensity in Cement Sector



Barriers to Energy Efficiency

- Lack of proliferation of DSM projects and concepts
- Lack of information about comparative energy use – especially of appliances bought by retail consumers
- Perceived risk due to lack of confidence in performance of new technologies – in appliances, building design, industrial technologies
- Higher cost of energy-efficient technologies
- Asymmetry in sharing of costs and benefits – especially in the buildings sector

Key regulatory interventions

- Provide energy use information
  - Labeling of appliances
  - Energy use information by units within industrial sectors
- Reduce perceived risk
  - Bulk procurement
  - Utility-driven Demand Side Management
  - Performance guarantee contracting, through ESCOs
- Mandate standards
  - Building Codes
  - Sectoral energy consumption norms in industry

Standards & Labeling Programme

The Energy Efficiency Standards and Labeling programme is a key thrust area of BEE under the Energy Conservation Act, 2001 with powers to:

- Direct display of labels on specified appliances or equipment (14.d)
- Enforce minimum efficiency standards by prohibiting manufacture, sale, and import of products not meeting the minimum standards (14.c)

The National Energy Labeling Programme launched by Hon'ble Union Minister of Power on 18th May, 2006.

- Voluntary scheme for Frost-Free Refrigerators & Tubular Fluorescent Lamps, ACs in place covering 60%, 90% and 65% of sales respectively
- To be extended to Distribution Transformers, CFLs Direct Cool Refrigerators, Motors, etc.

Energy Conservation Building Codes (ECBC)

- The draft Energy Conservation Building Code prepared for five climatic zones for all new commercial buildings
- The code includes energy efficiency aspects of building envelope, Heating, Ventilation, Air conditioning (HVAC), service hot water, pumping, lighting, electrical power and distribution system.
- Comments from various stakeholders received
- ECBC to be launched as a voluntary scheme soon with some pilot demonstrative projects

Energy Efficiency Programme in Buildings

- 8 Government buildings (including President House, PMO, Shram Shakti Bhawan) have been audited. Implementation of energy conservation measures in 4 buildings completed and remaining are on their way.

- Impressive Energy savings achieved in Rashtrapati Bhawan

Month	Estimated savings, kWh	Acutal Savings achieved, kWh
August, 2006	93080	124466
September,2006	97549	142597
October, 2006	97549	169179
November, 2006	105642	222567

- 17 additional Central Government buildings undertaken for second phase through ESCO mode.

- Energy Audit study in 15 Government buildings completed

Demand Side Management (DSM)

	Strategies
Short Term	•National Policy and strategies •Pilot projects CFL, Street lighting •Case studies, best practices/ guidelines on regulatory orders to promote utility DSM and Municipality DSM
Medium Term	• Load research capacity in 10 Utilities • Pilot projects- TOD, kVAh metering, Thermal Storage), Power factor improvement, Load segregation in rural feeders, • Facilitating innovative technologies • Suggestive principles for incentives to utilities for electricity saved
Long Term	• Load research capacity in all Utilities • 5% target for energy consumption reduction by DSM

Demand side measures taken by various Utilities

S.No.	Measures	Utilities
1	Two part tariff/ TOD	1.Himachal Pradesh Electricity Regulatory Commission,Shimla-2 2.West Bengal State Electricity Board Vidyut Bhawan 3.Torrent Power AEC Limited Electricity House, Lal Darwaja, Ahmedabad 4.Assam Electricity Regulatory Commission
2	Power factor correction capacitor	1.North Delhi Power Limited 2.Ajmer Vidyut Vitran Nigam Limited. DELHI 3.Torrent Power AEC Limited, AHMEDABAD 4.The BEST Undertaking, MUMBAI 5.Reliance Energy Limited, MUMBAI 6.The Mula Pravara Electric Co-op, Society Ltd. Shrirampur, AHMEDNAGAR, MAHARASHTRA 7.Southern Power Distribution Company of A.P. Ltd. (APSPDCL), A.P 8.Cochin Special Economic Zone (CSEZ), COCHIN 9.Purvanchal Vidyut Vitaran Nigam Ltd., Vidyut Nagar, PO: D.L.W, Varanasi
3	Penalties for harmonic injection	Himachal Pradesh Electricity Regulatory Commission, Keonthal Commercial Complex, Khalini , Shimla-2

Demand side measures taken by various Utilities (Contd.)

4	Solar lighting	Uttaranchal Jal Vidyut Nigam Limited, "Ujjwal", Maharani Bagh, GMS road, Dehradun-248 001
5	HVDS	1. North Delhi Power Limited, DELHI 2. West Bengal State Electricity Board, KOLKATA 3. Southern Power Distribution Company of A.P. Ltd. (APSPDCL), A.P 4. Purvanchal Vidyut Vitaran Nigam Ltd., VARANASI 5. Noida power company Ltd.
6	Installation of electronic meters	1. North Delhi Power Limited, DELHI 2. Noida power company Ltd. 3. Chhattisgarh State Electricity board
7	Energy audit	1. North Delhi Power Limited 2. Central Electricity Supply Company of Orissa Ltd. IDCO Tower 3. Tamil Nadu Electricity Board 4. Noida power company Ltd. 5. Chhattisgarh State Electricity board

Demand side measures taken by various Utilities (Contd.)

8	Providing Energy Efficient equipments to consumers by ESCO	Jaipur Vidyut Vitran Nigam Limited Vidyut Bhawan , Janpath ,Jaipur-302 004
9	Dedicated feeders for agriculture sector	West Bengal State Electricity Board
10	Pilot projects	1. M.P.Madhya Kshetra Vidyut Vitaran Co. Ltd 2. M.P.Poorva Kshetra Vidyut Vidyut Vitaran Company 3. Madhya Pradesh Paschim Kshetra Vidyut Vitran Co.
11	Energy Efficient lighting program	1. BESCOM Corporate Office, Bangalore
12	Replacement of GSL by CFL	1. Cochin Port Trust, Willingdon Island, Kochi-682 009 2. Assam Electricity Regulatory Commission 3. Chhattisgarh State Electricity board 4. NDPL/ BSES
13	Installation of solar water heater	1. Cochin Port Trust , Willingdon Island, Cochin 2. Assam Electricity Regulatory Commission
14	Installation of electronic choke	1. Cochin Port Trust , Willingdon Island, Cochin 2. Chhattisgarh State Electricity board

Programme for Strengthening of SDAs

- Institutional, physical and financial support
- Information and knowledge sharing by BEE
- Facilitating activities to promote energy efficiency in states

SDA Strengthening Programme- Deliverables Short Term

Programme	Outcomes/ Deliverables
Capacity Building/ Outreach ➢Organisational setup (including SECF) ➢Workshop, conferences ➢Advertising specially in local languages ➢State Energy Conservation Awards ➢Internet platform	 ➢Infrastructure/ manpower/ funding in position ➢Adequate material/ speakers ➢Templates for advertisements ➢Guidelines/ protocols/ procedures adoption ➢Organisation website
Designated Consumers Programme ➢Designated consumers ➢Reporting process (format, method, etc.) ➢Training of designated consumers for reporting ➢Accredited auditors ➢Energy Managers	 ➢Identification, listing and notification ➢Software for input collection/ collation and validation ➢Enable online reporting ➢Adoption of BEE accredited list ➢Adoption of BEE accredited list

SDA Programme- Deliverables Medium/ Long Term

Standard & Labeling Programme ➢Implementation ➢Outreach	➢Programme for at least two equipments/ appliances ➢Requisite availability of Promotional material
Energy Conservation in Govt. Buildings ➢Retrofit in government buildings	➢Energy Audit of at least two buildings in each district headquarter
Long Term- ECBC ➢ECBC ➢Training programme	➢Mandatory for all new buildings ➢Institutional set up in all district headquarters to target Architects, implementation agencies, developers and other stakeholders
➢Developing linkages and programmes for energy efficiency	➢Policies and programmes for market transformation to achieve at least 5% reduction in energy consumption.

Designated Consumers (DCs)

- EC Act mandates Government to designate consumers who consume electricity beyond a benchmarked limit.
- The DCs are required to appoint Energy Manager
- DCs are required to adhere to energy efficient consumption norms stipulated
- DCs are required to submit consumption information, duly authenticated by the Energy Manager to BEE/ SDAs as prescribed
- Auditors/ Managers certification examination held 3 times successfully- over 2700 Auditors/ Managers accredited/ certified- 4th examination being conducted
- Web based e-filing of energy consumption returns to be mandated soon- **first of its kind initiative**

Designated Consumers and SMEs Programme

	Strategies
Short Term	Initiate comprehensive energy consumption norm studies in 15 sub-sectors Development of specific energy consumption norms for 3 sectors Initiate comprehensive studies in 25 clusters of SMEs Initiate studies to establish specific fuel consumption norms in Transport sector Initiate online reporting system for energy data
Medium Term	Preparation of industry specific manuals of energy efficient technologies and consumption norms Dissemination of best practices, demonstrative case studies Reporting and verification protocols, training and capacity building at cluster/ sub-sector level Energy consumption norms for 6 sectors
Long Term	Target of at least 5% reduction at each sub-sector and cluster level Integration of efficient fuel consumption norms in transport sector

Agriculture DSM

- Immense potential
- Capacity to reduce losses of Utilities and subsidy of Governments
- Those responsible for DSM should be
  - Knowledgeable
  - Competent
  - Devoted
- Effective DSM needs proper
  - Drafting of Purchase specifications
  - Selection of vendors
  - Installers

- Targets
  - Farmer friendly and educative
    - No reduction in output of farm
    - Least of Zero cost-burden
    - Reduced maintenance
  - Should achieve
    - Reduction in connected load
    - No theft of power
    - More comfortable regulation of power
- Appraisal and Review

Key Barriers to Ag DSM

- Vested interest in recommending cheap pump needing repetitive maintenance
- Efficiency issue is neutral to farmers due to subsidised or zero cost power.
- Repetitive maintenance and higher power consumption make LCC of pumps from unorganized sector about 35% higher.
- Vicious circle - DISCOMS use to circumvent their inefficiencies, political class to gain votes, losses in the system, high subsidy bill of governments, unreliability of power supply, high tariff to paying consumers and more losses....

Situation Assessment

- Farmers need / want
  - * Adequate water for irrigation
  - * Reliable electricity
  - * 24 x 7 availability
- Policy makers need / want
  - * Better livelihoods for farmers
  - * Better electricity service for the majority of citizens who live in rural areas
- Discoms are caught in the middle
  - * Priorities urban and Commercial/industrial
  - * Low/no Ag tariffs stimulate consumption
  - * Low/no cash flow limits service quality in rural areas
  - * High agricultural consumption crowds out profitable sales
- A difficult technical model with many moving parts
  - * Human factors, organization dynamics, and the need for extensive communication, education, Ag extension services and persuasion will be key to success

The Dimensions of the Challenge

- For Policymakers: How can the efficient use of scarce resources be achieved when low prices signal abundance?

  - Can an affordable subsidy be maintained while providing better electric service to farmers and other rural customers?

- For Discoms: How can adequate irrigation water for today be obtained at a reasonable cost?

- For Society: How can farmers earn a good livelihood without impairing sustainable water availability for the next generations?

Alternatives

- No Change – This approach does not appear to be sustainable and is creation increasingly difficult problems
  - Increasing damage to aquifers threatens future water supplies
  - High agricultural consumption of electricity (30-40% of total consumtion) may crowd out profitable sales to other customers
- Cost Based Pricing – This is economically efficient but very difficult in socio-political terms
- Administrative Controls- Requires full metering and significant monitoring and enforcement capabilities
- Energy Service Company- This solution employs a combination of market drivers without disturbing the status quo to create a win-win-win situation
- Government Farmers Compact – The direct beneficiary of the intervention would be Government and farmers
  - Government: saves on subsidy
  - Farmers: improve their economic and living conditions

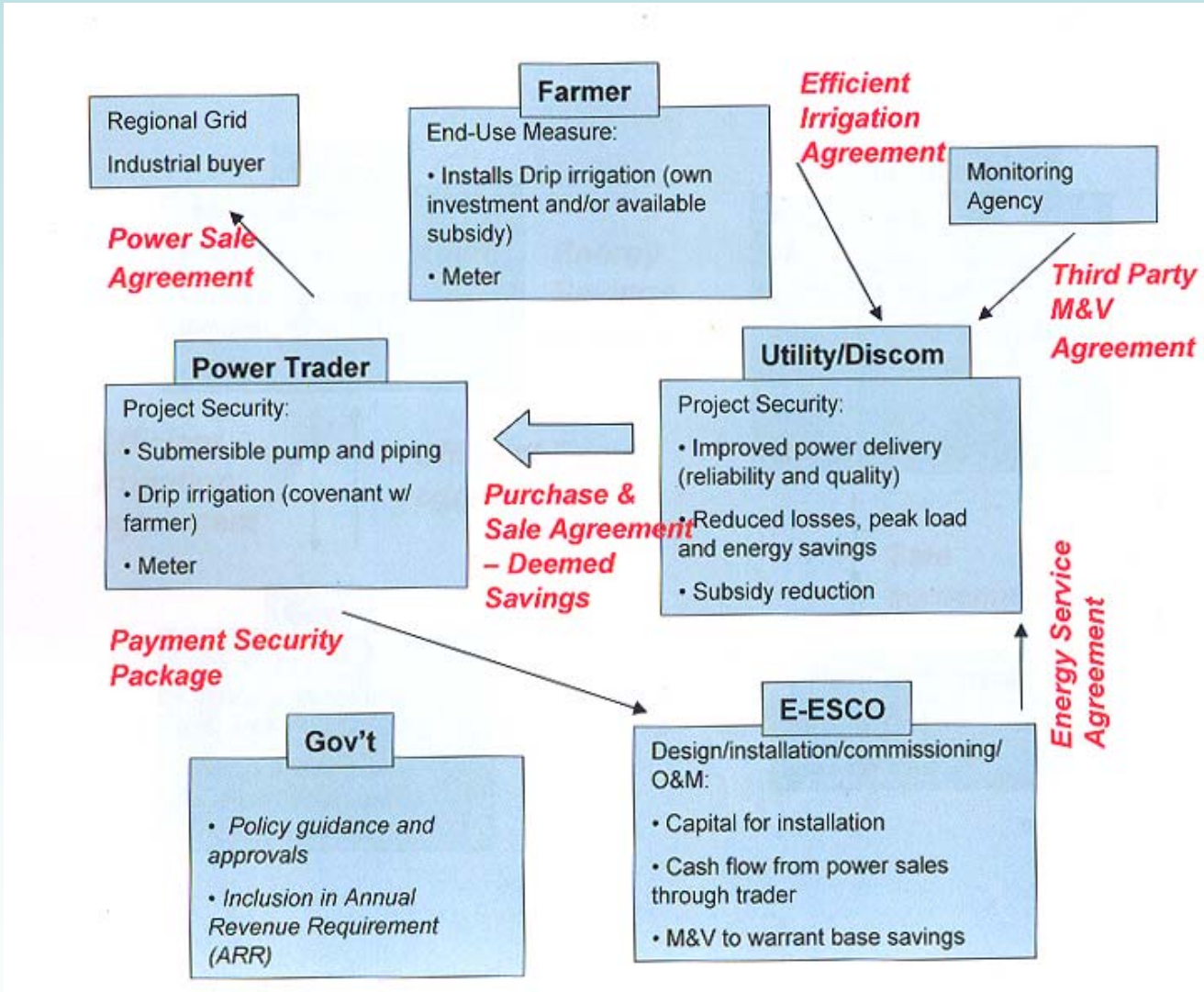
Menu of Possible Interventions

Distribution Upgrades	Pumpset Replacement	Irrigation Upgrade	Agricultural Best Practices	Watershed Management
Interventions				
•HVDS Upgrades •Load Management	• Pumpsets meeting BIS Standards • Right-sized pumpsets • Panel boards • Fittings, valves, • spares	• Drip or sprinkler irrigation • Closed storage • tanks (preferably) or liners for open tanks • Conveyance	• Shift to less water intensive crops • Best Practices • Reduce H_2O application • Seeds/Fertilizer/Pesticides	• Rainwater harvesting • structures • Ground-water recharge • Tank rehab • Bunds/Check • Dams
Operational Functions				
• Improved billing and collection	•Maintenance	•Extension services •Maintenance	• Extension services • Marketing schemes	• Participatory Planning • Field advocacy

Stakeholders

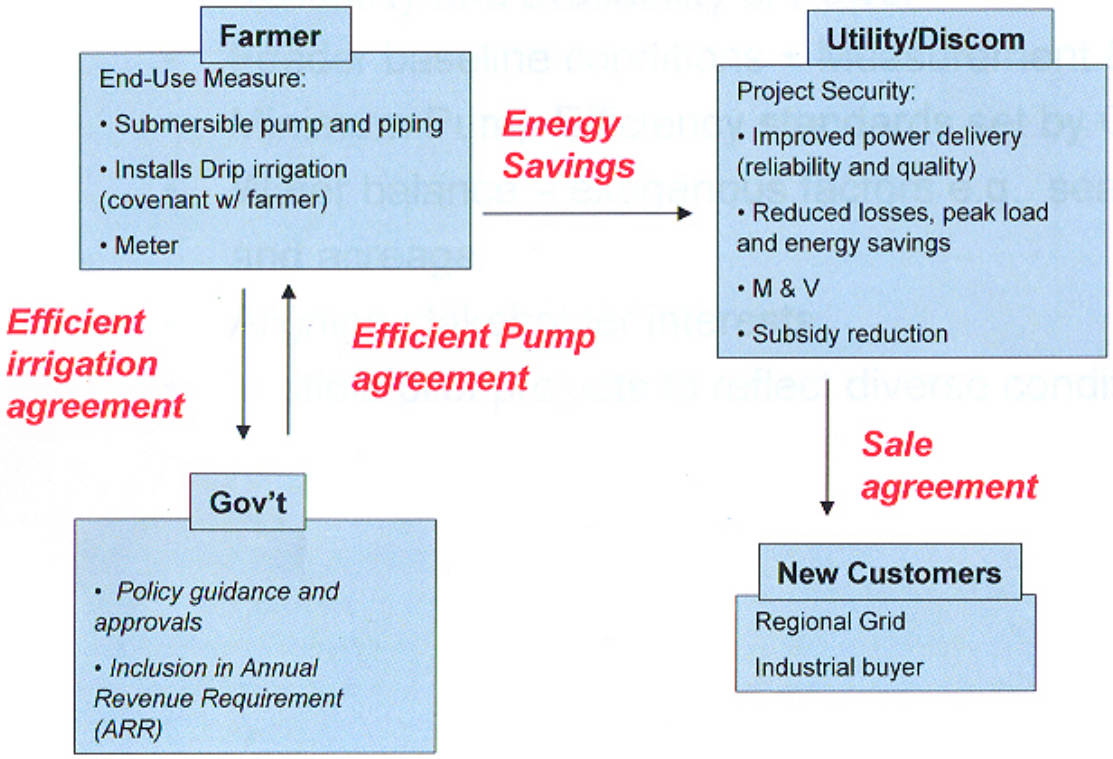
- State Government
- Farmers (user of subsidized / free electricity)
- Electricity Regulator
- Financing Institutions
- Govt. of India – Ministry of Power, Water Resources, BEE, etc.
- Pump-set Manufacturers
- Drip irrigation/sprinkler system manufacturers
- Public at large

E-ESCO Structure For Ag DSM Intervention



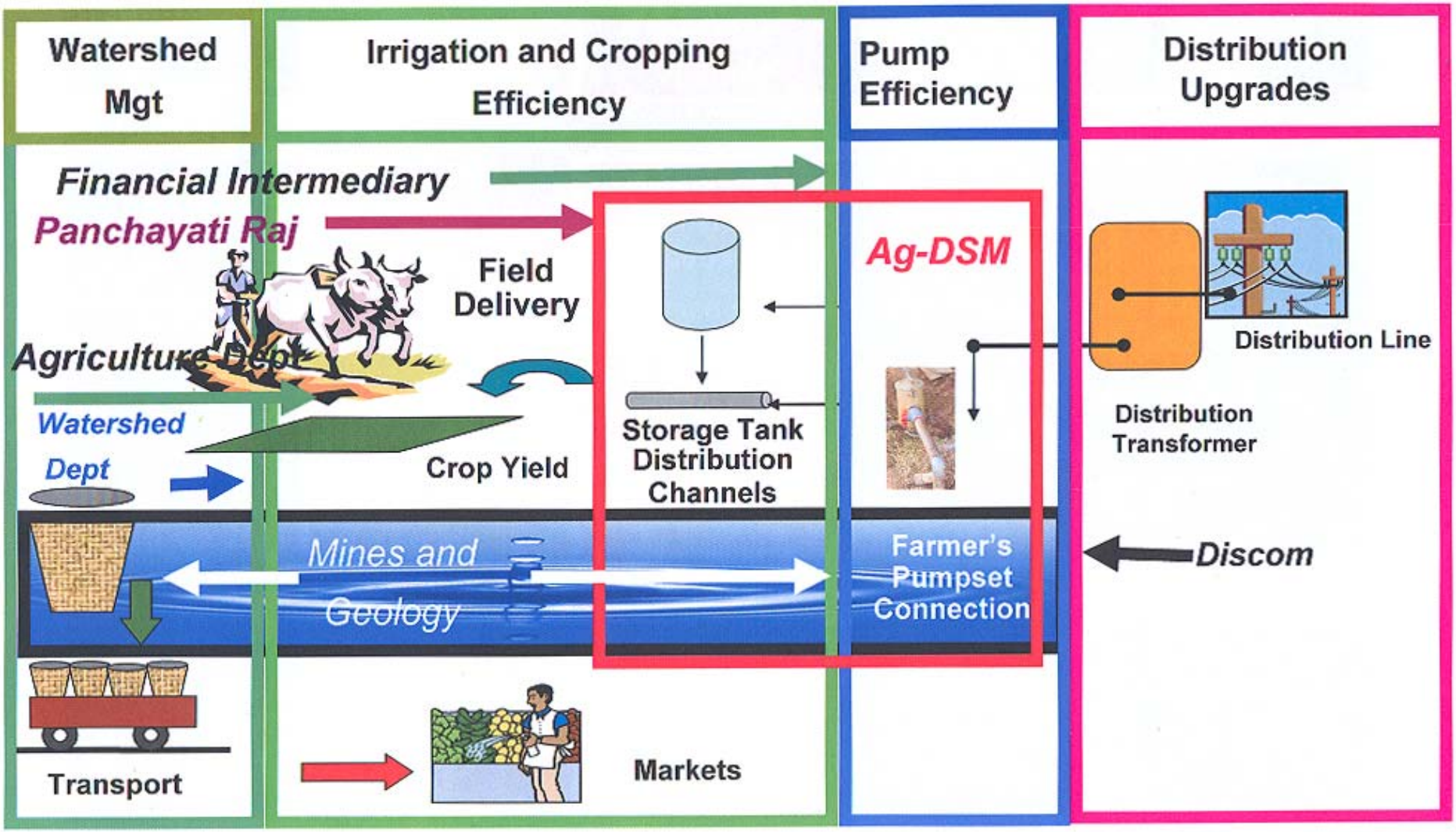
- Project design – addressing KWH and water savings
- Baseline measurements and M&V for energy and water, through metering
- Payment security – single revenue streams to E-ESCO & power trader
- Rapid sales process – utility to identify all possible installations
- Transactional issues include power trading and TOU matching of savings

Government- Farmer Compact



- Project design: addressing integrated KWH and water savings
- Baseline measurements and M&V for energy and water, through metering
- Rapid sales process – utility to identify all possible installations
- Transactional issues include power trading and TOU matching of savings
- Capital for installation
- Enhanced EPC
  - Design/installation/commissioning
  - O&M
  - Cash flow from power sales through trader
- M&V to warrant base savings

Elements of Water and Energy Management



Expectations from Joining IEA

- International Best Practices
- Deliverables for removal of EE/ EC barriers
- Capacity building and training of Utilities / Regulators on DSM practices
- Financing Institutions
- Synergy between Government of India Programmes on EE/ EC and Tasks of IEA

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