

Advancing Energy Security: A Strategic Vision for Energy Efficiency in India

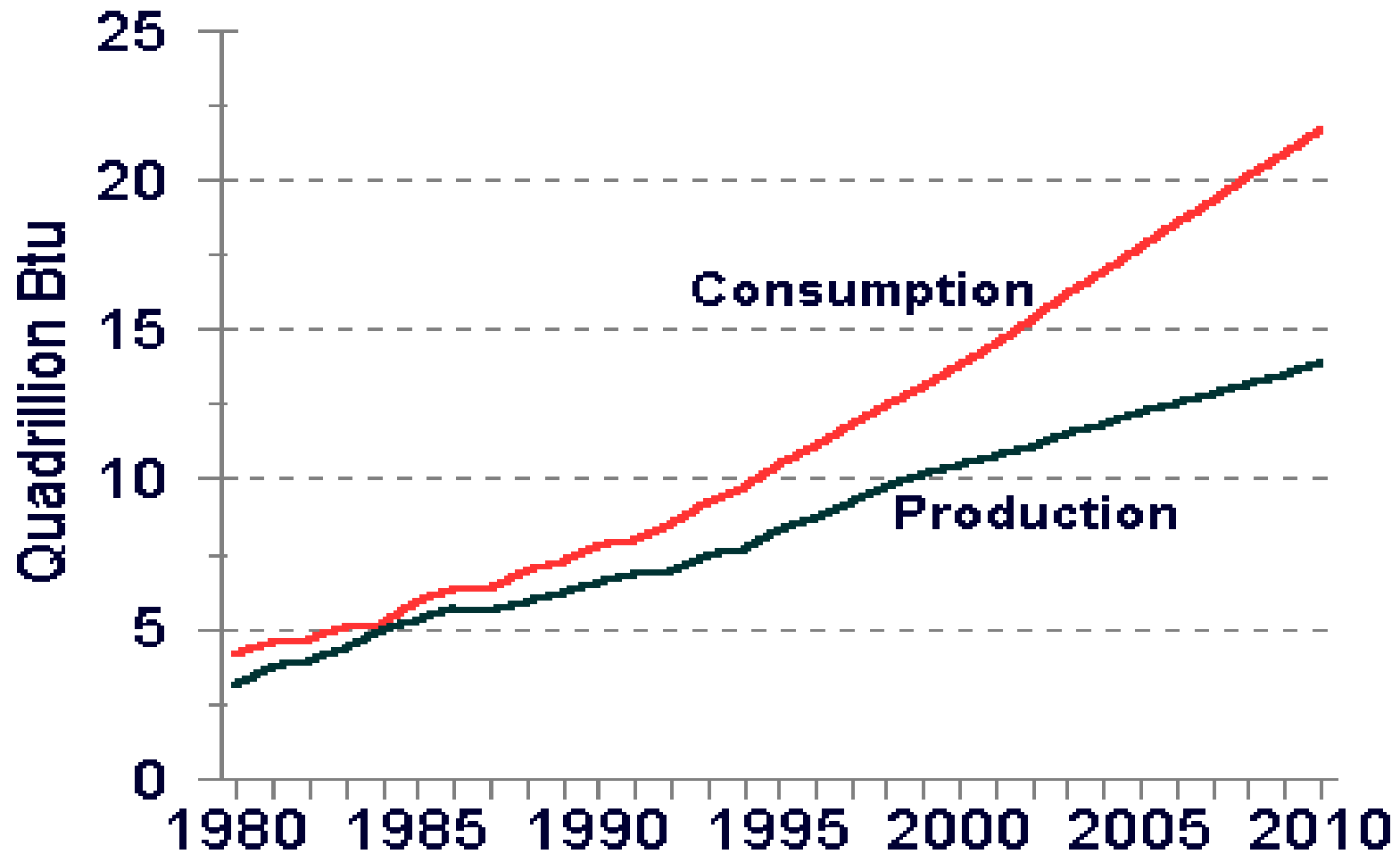
S. Padmanaban, USAID

**Seminar on Energy Conservation and Industrial Waste
Management**

Bangalore

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India's Energy Balance



Source: U.S. Energy Information Administration

Indian power sector – Overview

Significant capacity addition
over the years

CAGR = 8% pa

But achievement of targets has
been poor

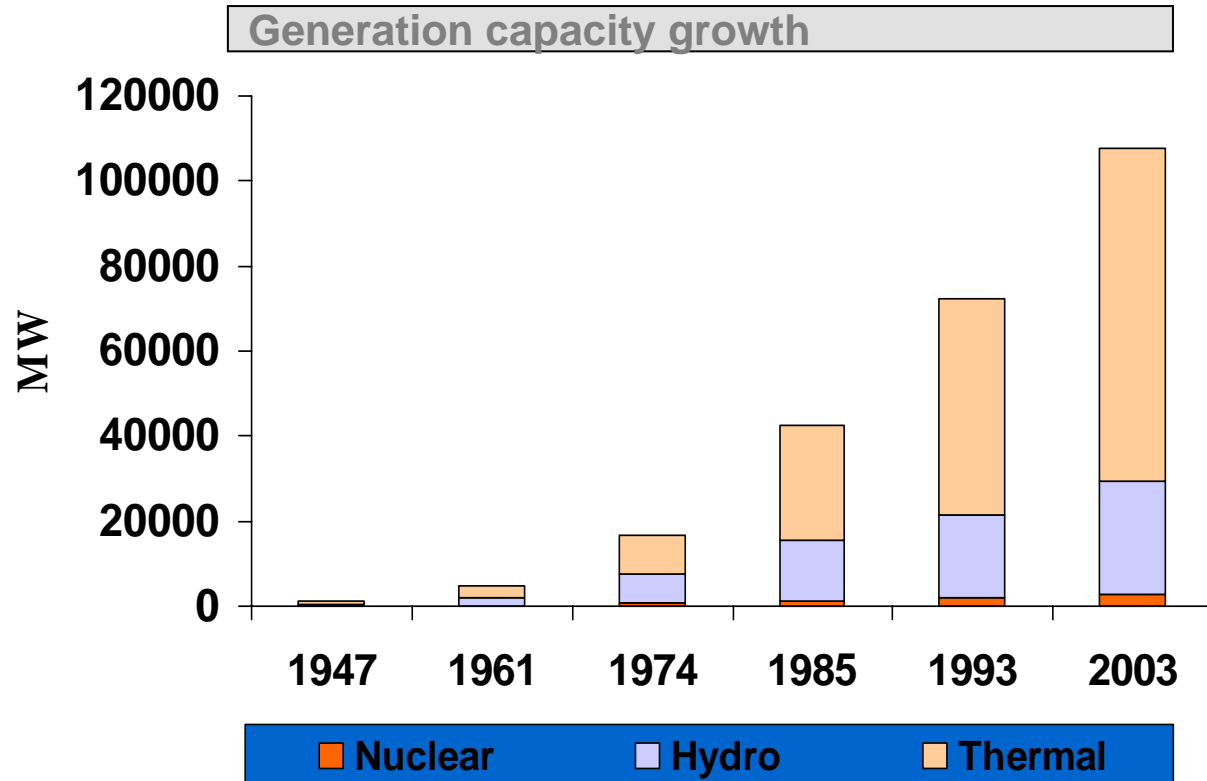
9th plan Target Achievement =
47.2%

Per capita consumption is low
even by developing country
standards

Per capita cons. = 360 kWh

World average = 2200 kWh

US average = 10,500 kWh



Estimated capacity expansion required = 10,000-15,000 MW/annum

ENERGY EFFICIENCY (EE) TRENDS IN INDIA

- EE as a strategic solution to address national security and fiscal deficit**
- Indian corporates have begun to institutionalize EE**
- Public Use of Energy Represents a Major Opportunity**
- Greatest Advances came from vendors**
- ESCOs mostly are small and generally under-capitalised**
- Best result is obtained when public policy mechanisms are teamed with business policy**

Energy Efficiency Programs

- ***India has a long history of promotion of energy efficiency through institutions such as NPC, PCRA, BEE, CII, FICCI, etc.***
- ***Green Business Centre, Hyderabad***

US Programs – over 30 years

- Voluntary programs
 - ENERGY STAR label, Industry agreements
- Building and equipment efficiency standards (CLASP)
 - Refrigerators, A/Cs, other appliances
- Market transformation programs –
 - Demand-Side Management (DSM) utility programs
- Financing –
 - Energy Service Companies (ESCOs)
- Government procurement (PEPS) –
 - Federal Energy Management Program (FEMP)
- Tax credits
- Accelerated R&D

Maharashtra

- Gross state domestic product (GSDP)
 - Rs. 2,95,191 crores in current 2002-03 prices
- Government revenue deficit –
 - Rs. 9,037 crores 2003-04 (Prov.), up from Rs. 609 crores in 1995-96
- Fiscal deficit –
 - Rs. 18,460 crore (R.E.); 5.6% of GSDP up from 2.8% in 1995-96
- Maharashtra State Electricity Board (MSEB):
 - Commercial losses for 2001-02: Rs. 3527 crores

Electricity energy efficiency

Economic benefit

End-use device	Incremental Capital Cost (Rs./kW)	CCE (Rs./kWh)	Electricity Tariff (2003-04) (Rs./kWh)	Potential for Electricity Savings (GWh)
Residential				
CFL (Lighting)	3,508	0.90	2.79	866
Refrigerators	13,075	1.03	2.79	717
Solar water heater	4,444	2.80	2.79	1271
Commercial				
Lighting	3,334	1.44	3.91	317
Refrigerators	13,075	1.03	3.91	746
Agriculture IPS				
New unit	3,217	0.69	0.00	621
Rectification	2,234	0.48	0.00	621
Replacement	6,032	1.73	0.00	621
Industrial				
Motors	16,000	0.60	3.00	318
Variable Speed Drives	20,000	0.75	3.00	496
Lighting	3,334	1.44	3.00	340
CCE: Cost of conserved electricity includes a transaction cost that adds 30% of the incremental capital cost				6933

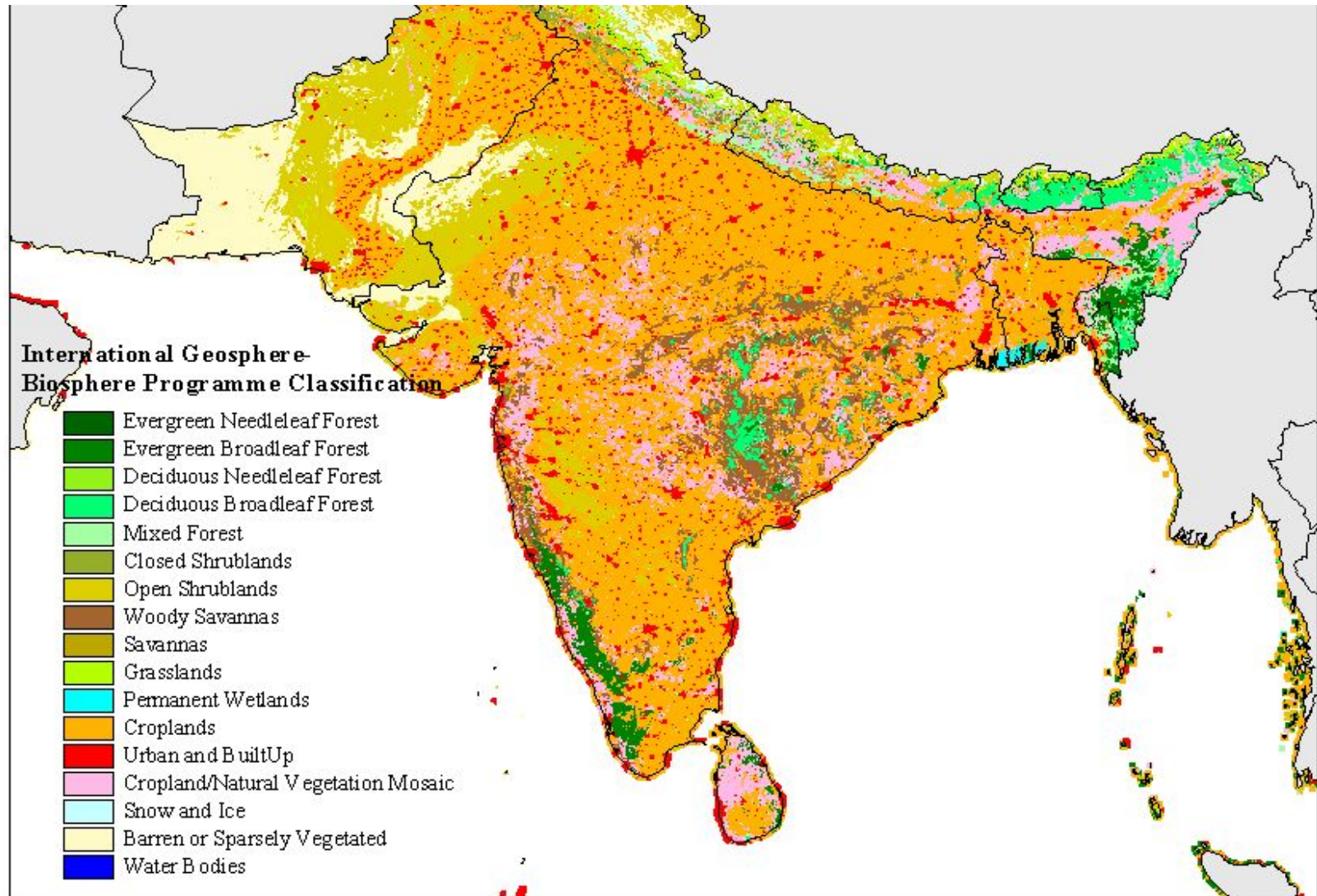
- **Metric:** Cost of conserved electricity (CCE)
- Allows the cost of efficiency improvement to be compared against the electricity tariff

Numbers in red indicate end-use efficiency improvement is not cost effective

EE and Fiscal Deficit

- **Maharashtra faces several challenges –**
 - Growing electricity shortage
 - Fiscal deficit
- **Energy efficiency can provide relief for these problems. Over time it can**
 - Reduce almost 90% of the electricity shortage
 - About 1300 MW and 6,900 GWh
 - Improve MSEB revenue
 - About Rs. 378 crores / year
 - Reduce government subsidy and increase tax revenue
 - Subsidy reduction about Rs. 530 crores per year
 - Increased tax revenue about Rs. 1,100 crores per year
 - Net revenue increase of Rs. 1,600 crores per year or about 18% of the state's revenue deficit
 - Agricultural efficiency program costs – Rs. 494 crores

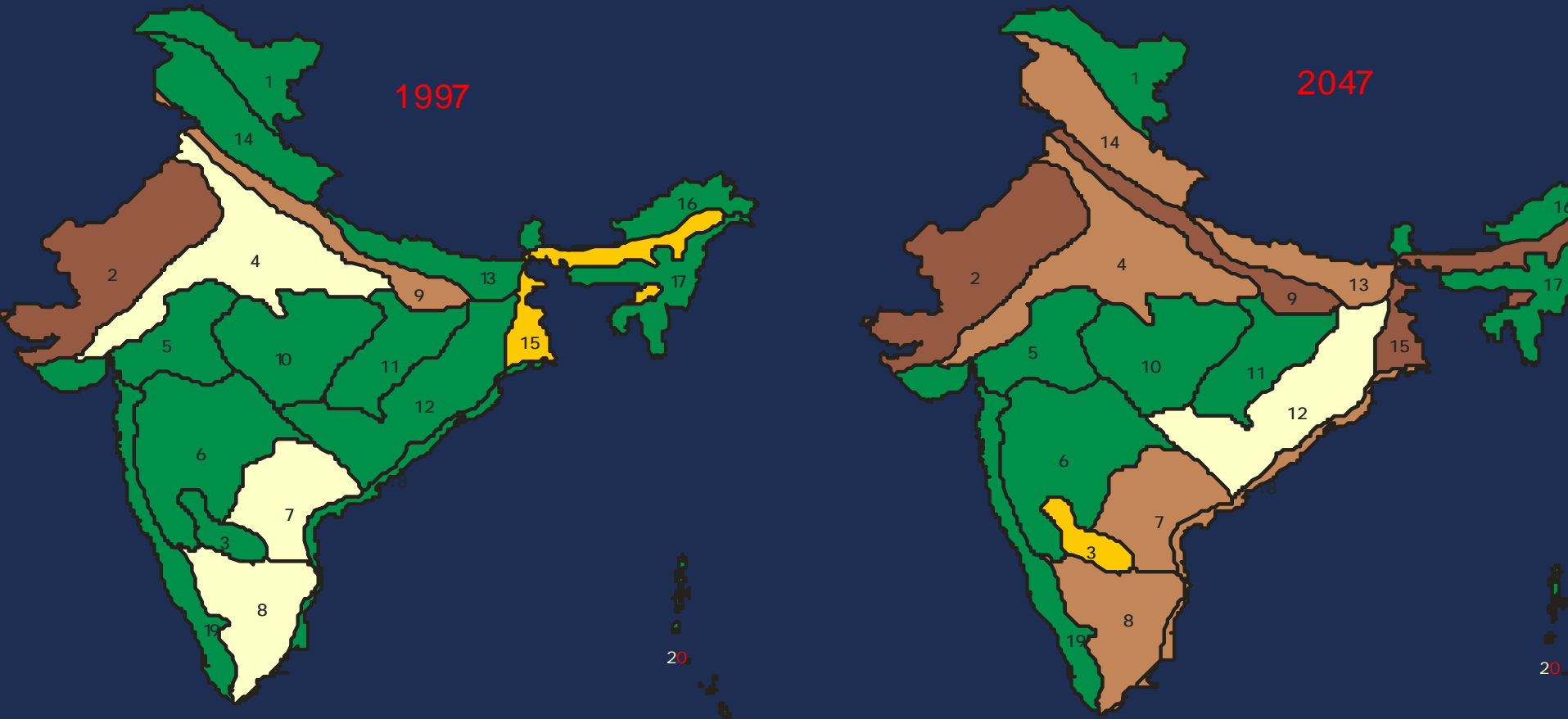
Land Cover, 1992-93



Sources: Global Land Cover Characteristics Database, Version 1.2. 1998. USGS EROS Data Center; ESRI 1996.

This map was prepared at World Resources Institute, April 2001. Not intended for distribution.

Increase in water stress in India (1997 - 2047)



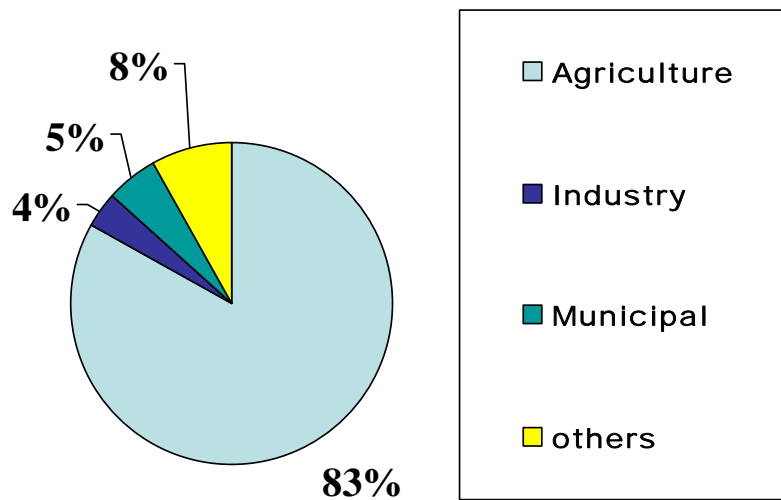
Percentage of demand that can be met



AGRICULTURE'S IMPACT IS SIGNIFICANT

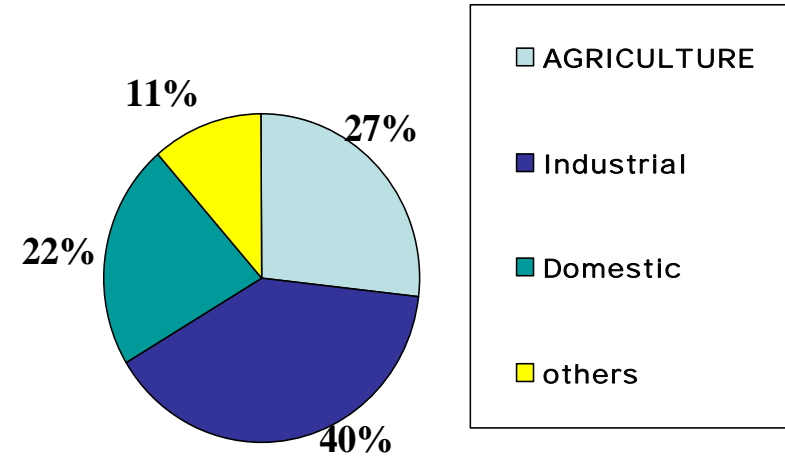
Agriculture is the largest user of water and accounts for about one-third of total power use

2000 Water Use Pattern



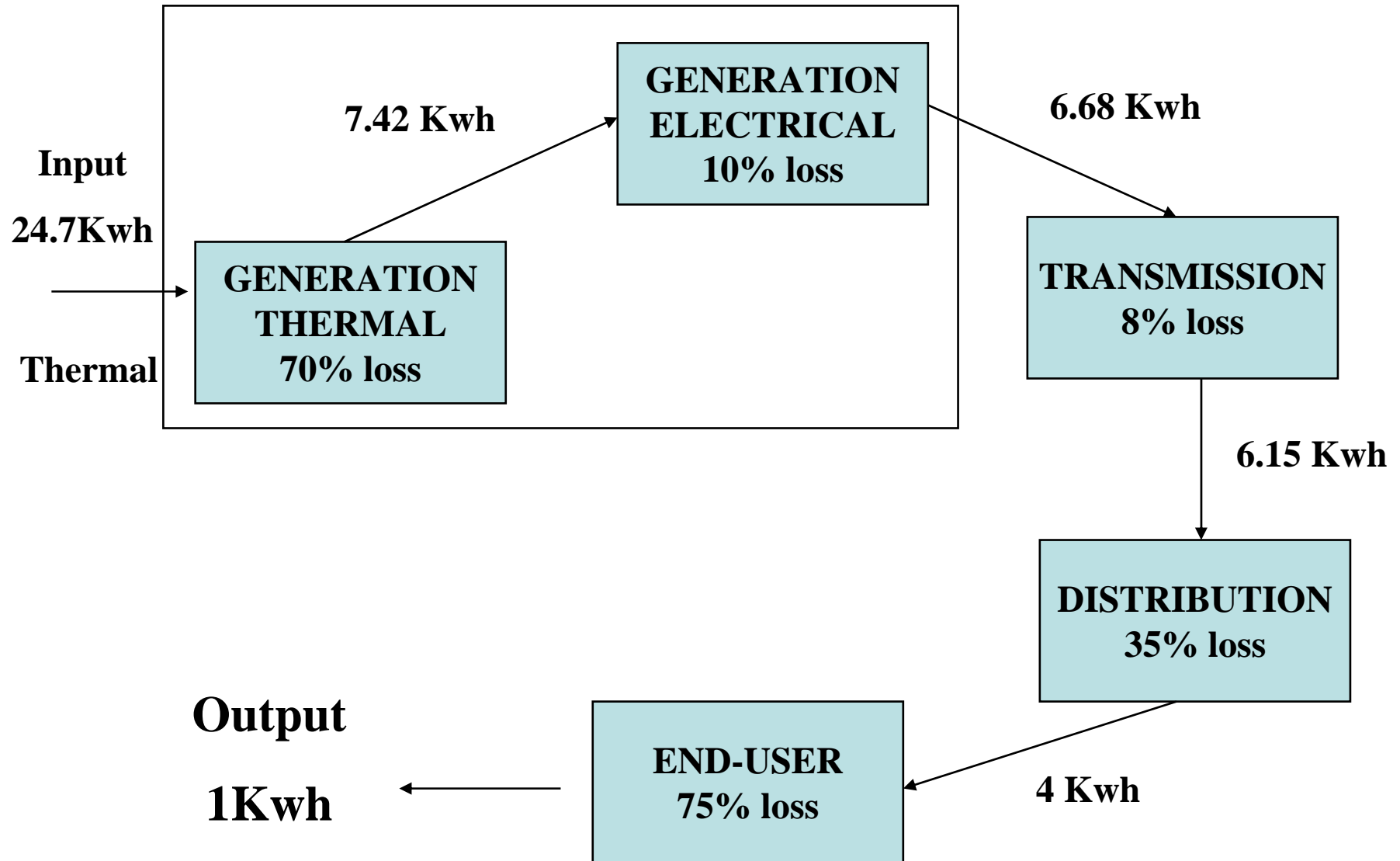
2000 Total water consumption: 552 bcm

2000 Energy Use Pattern

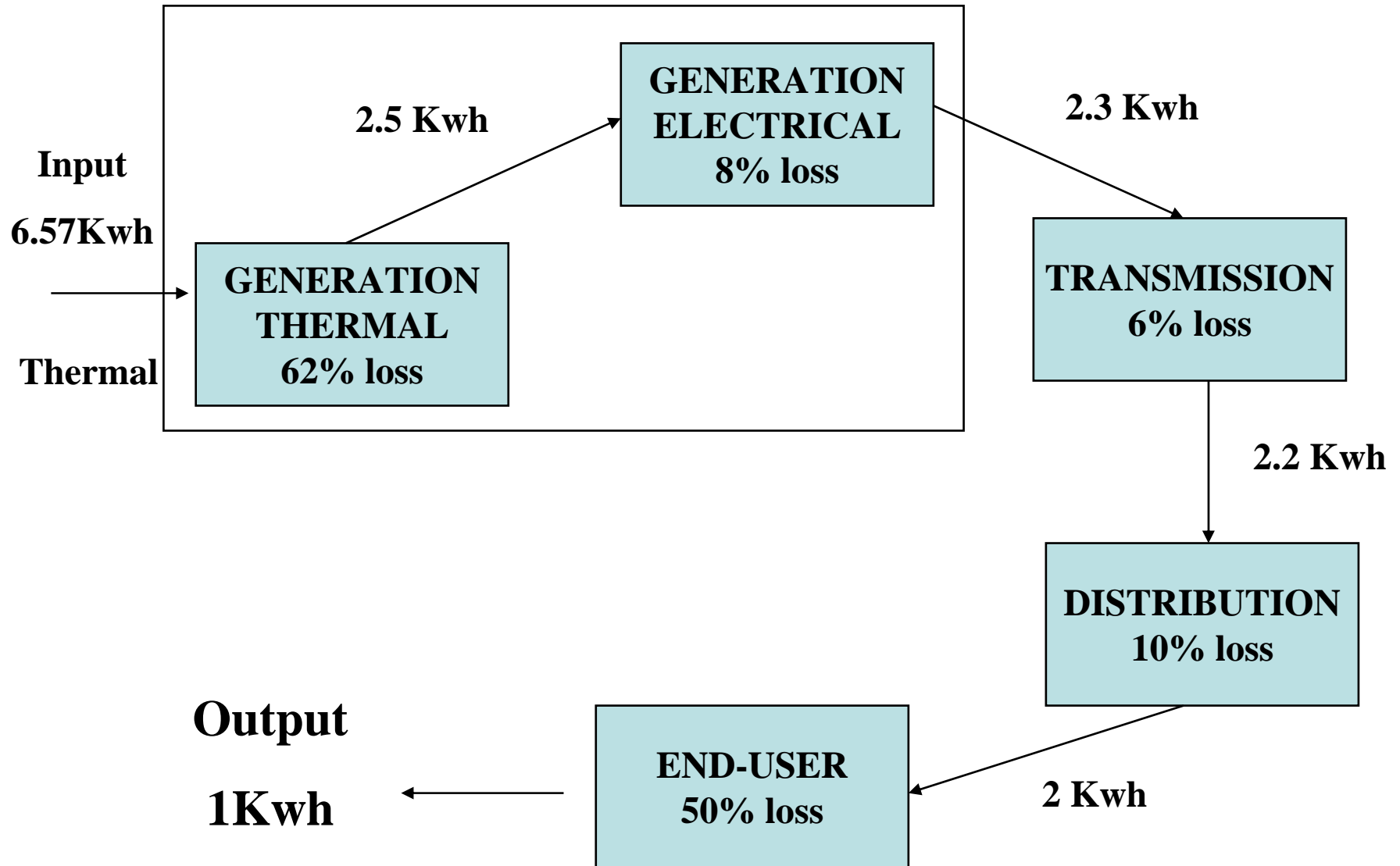


2000 Total Energy consumption = 395 billion kWh

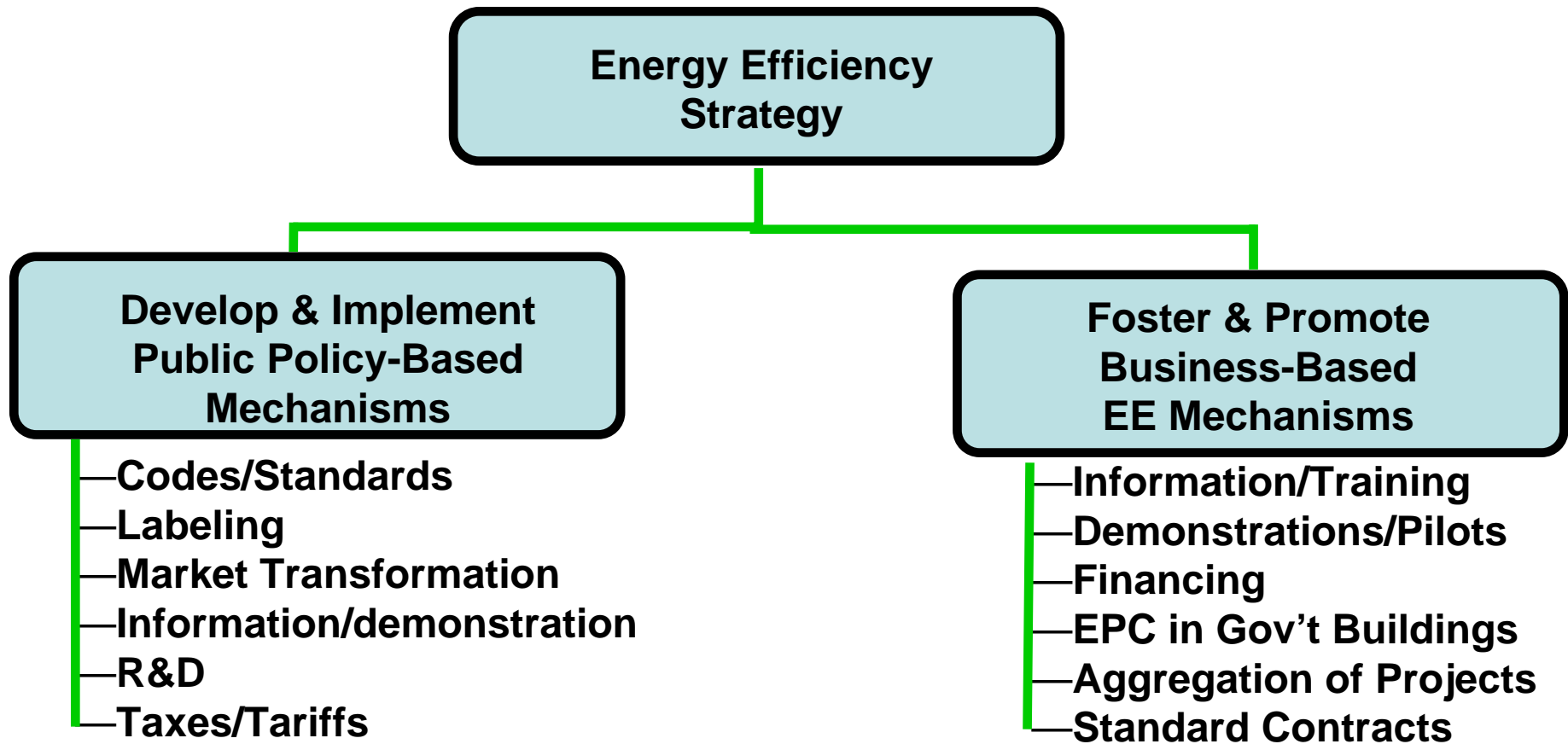
PRINCIPAL TECHNICAL LOSSES - AGRICULTURAL SECTOR - INDIA



PROBABLE TECHNICAL LOSSES - AGRICULTURAL SECTOR - INTERNATIONAL STANDARD



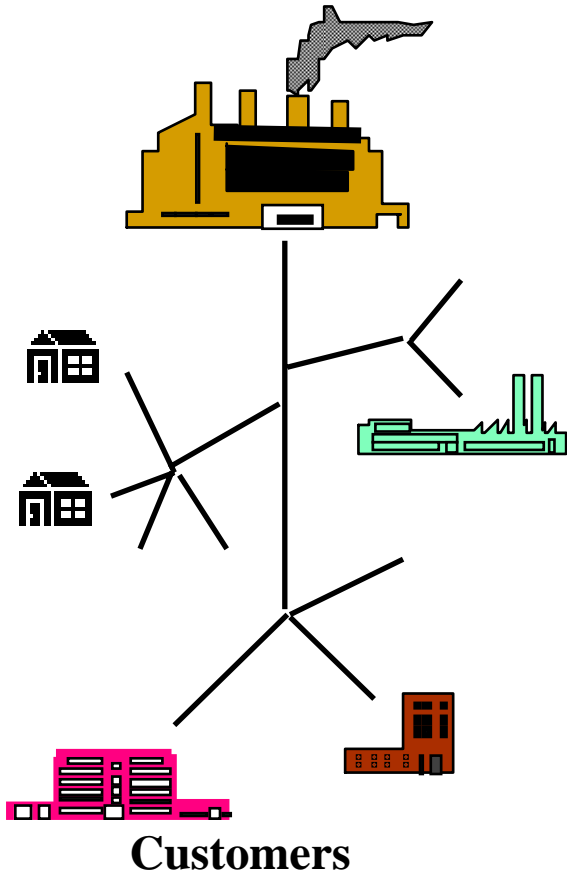
Key Elements of Energy Efficiency Strategy



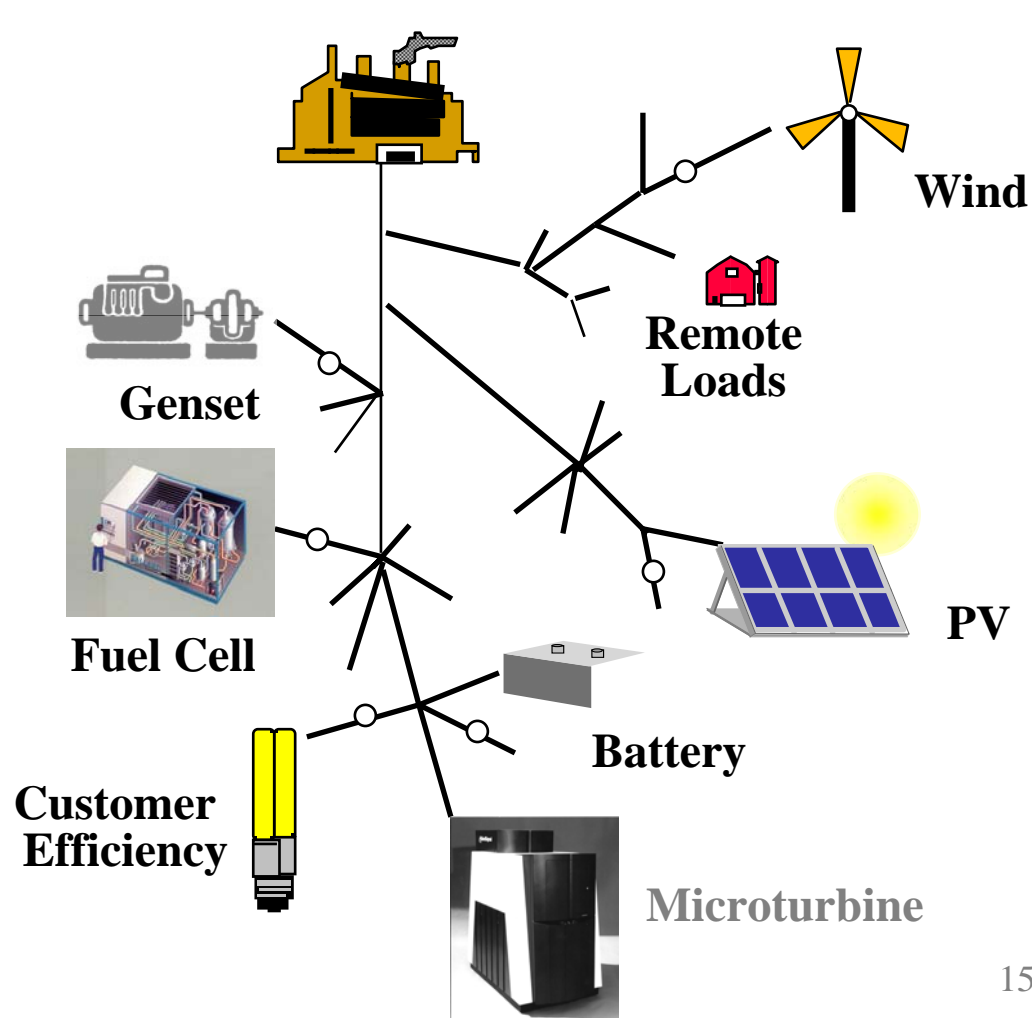
Today's Central Utility

Tomorrow's Distributed Utility?

Central Generation



Central Generation



CONCLUSION

- **Energy Efficiency (EE) is a key driver for Energy Security, but:**
 - It must complement supply and RE strategies
 - We must work on both sides of the energy equation
- **Over the medium term, EE efficacy to be demonstrated to validate impact on:**
 - Fiscal deficit and bridging shortages
 - Improving capital productivity, and
 - Accelerating transition to renewable energy
- **Over the long term, EE will advance energy security**