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

**S. Padmanaban, USAID**

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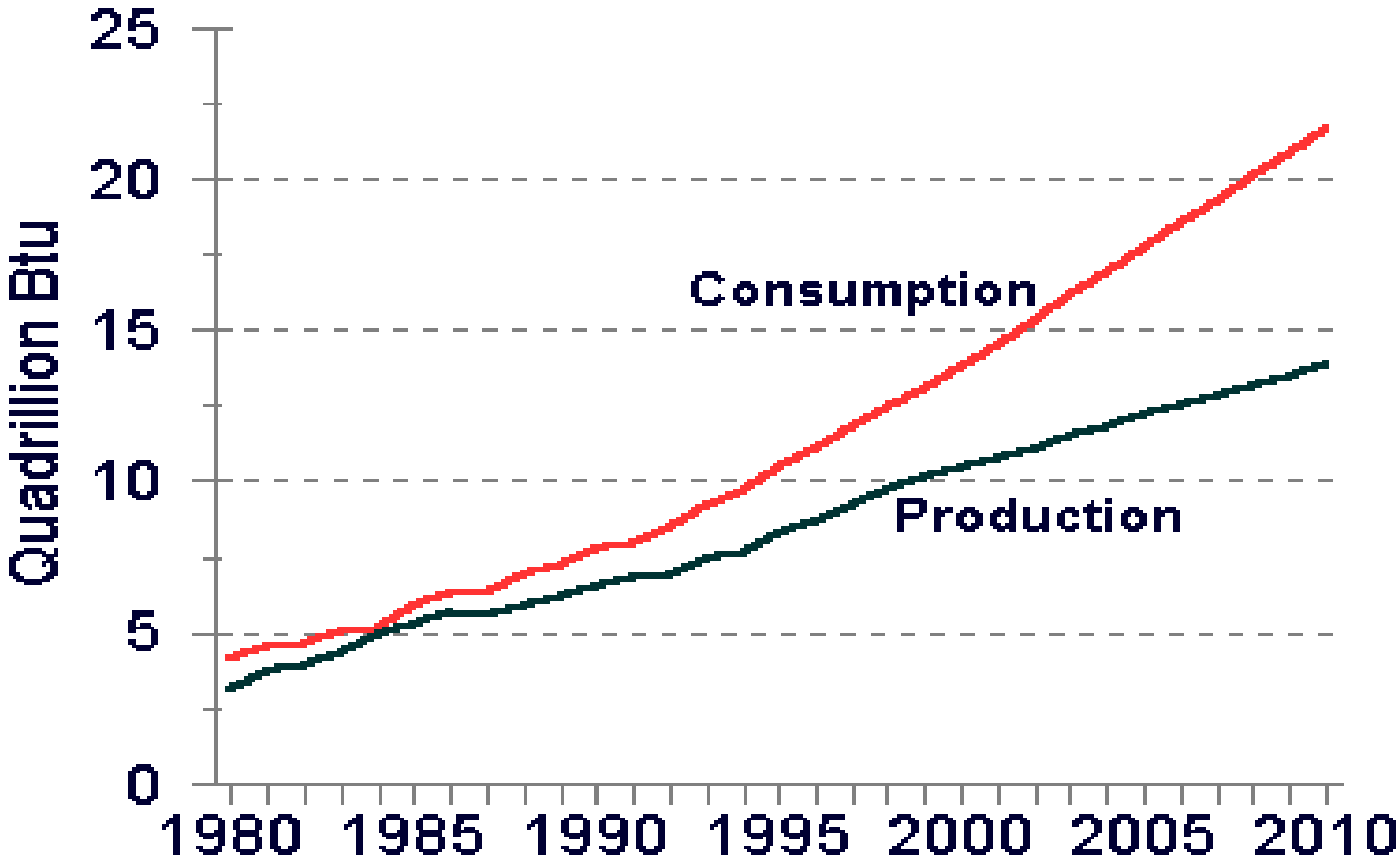
# India's Energy Balance




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

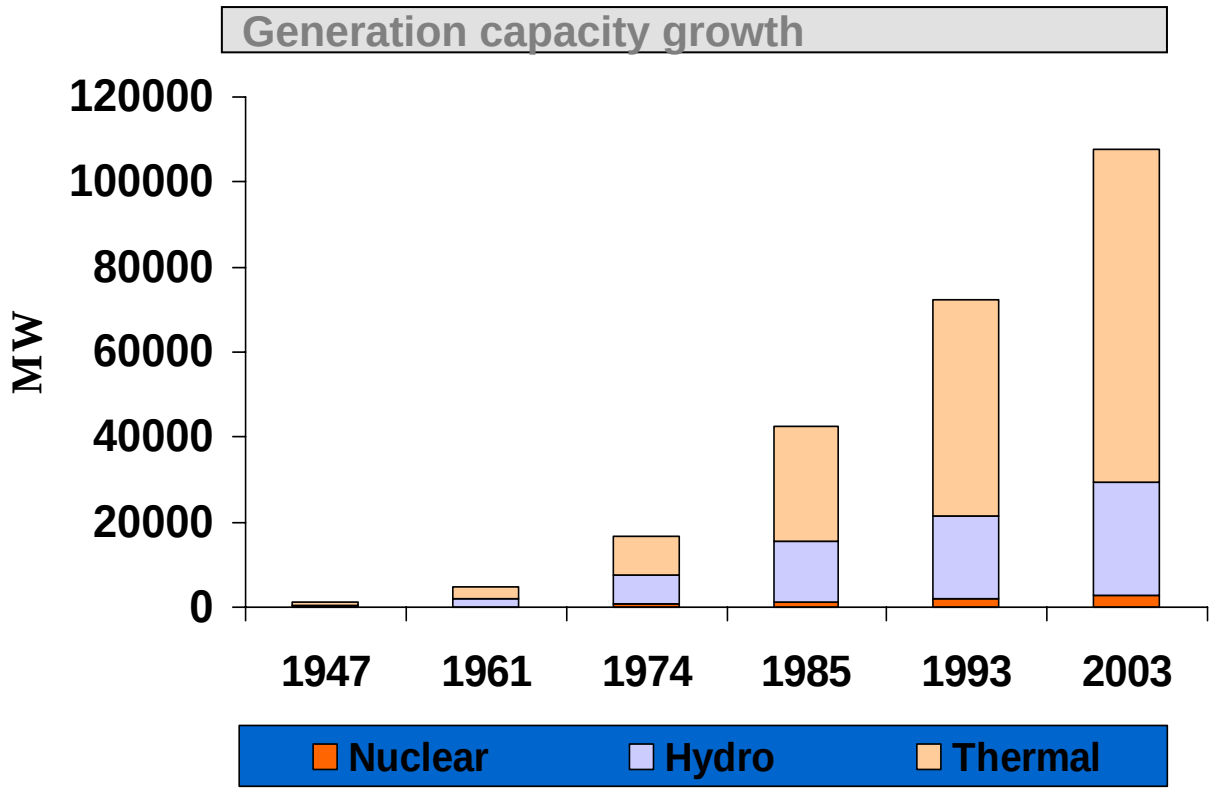
9th plan Target Achievement = 47.2%

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 | | | | 6933 |
| that adds 30% of the incremental capital cost | | | | |

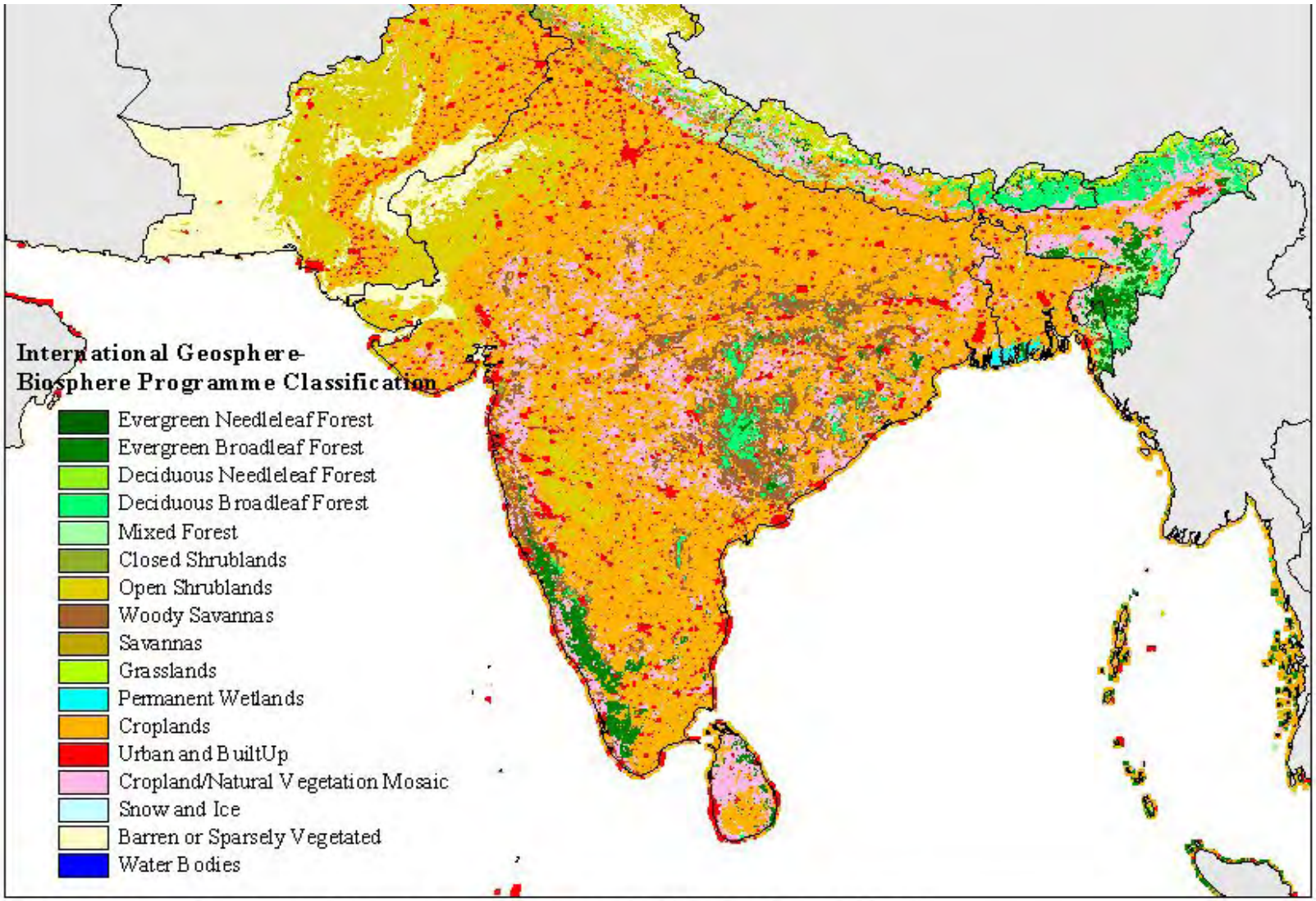
- **Metric:** Cost of conserved electricity (CCE)
- Allows the cost of efficiency improvement to be compared against the electricity tariff

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**

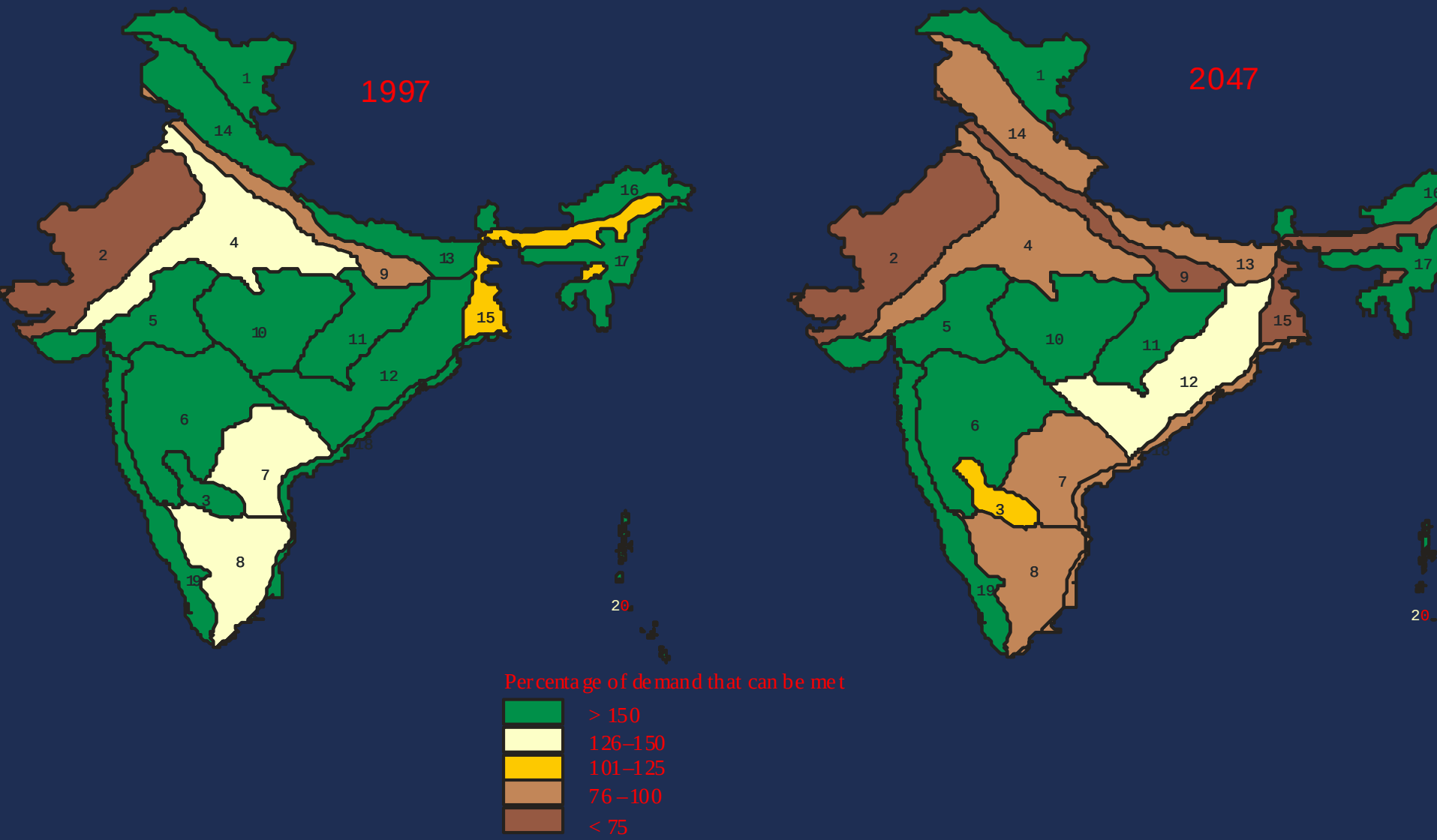
# Land Cover, 1992-93




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.

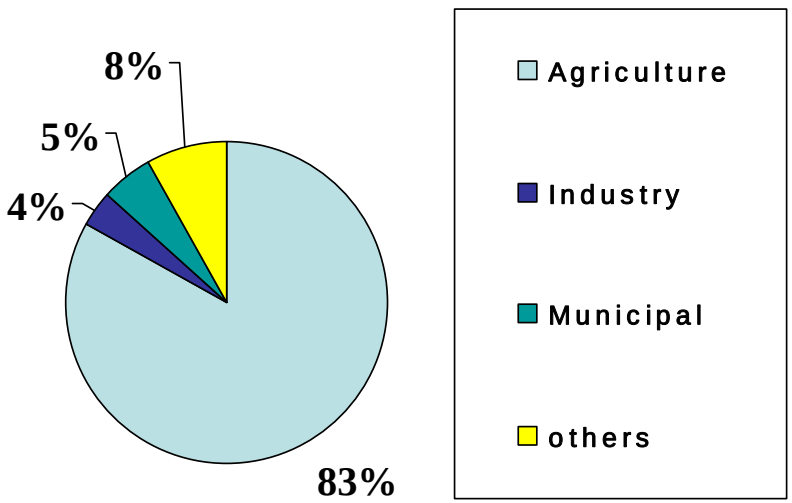
# Increase in water stress in India (1997 - 2047)



# AGRICULTURE'S IMPACT IS SIGNIFICANT

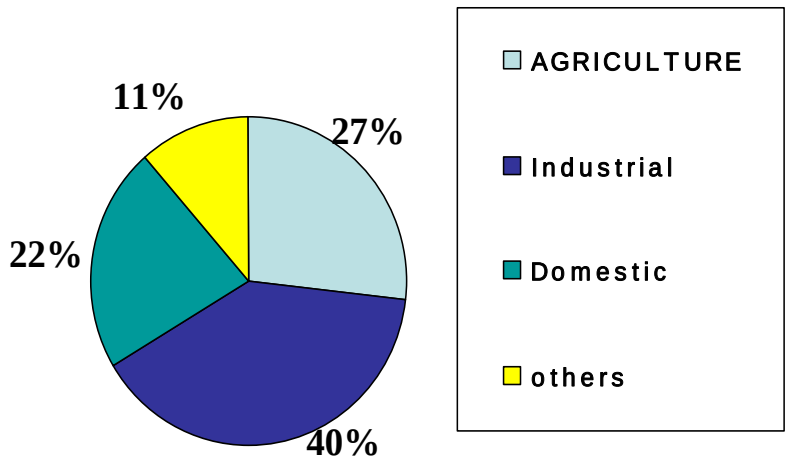
Agriculture is the largest user of water and accounts for about one-third of total power use

2000 Water Use Pattern



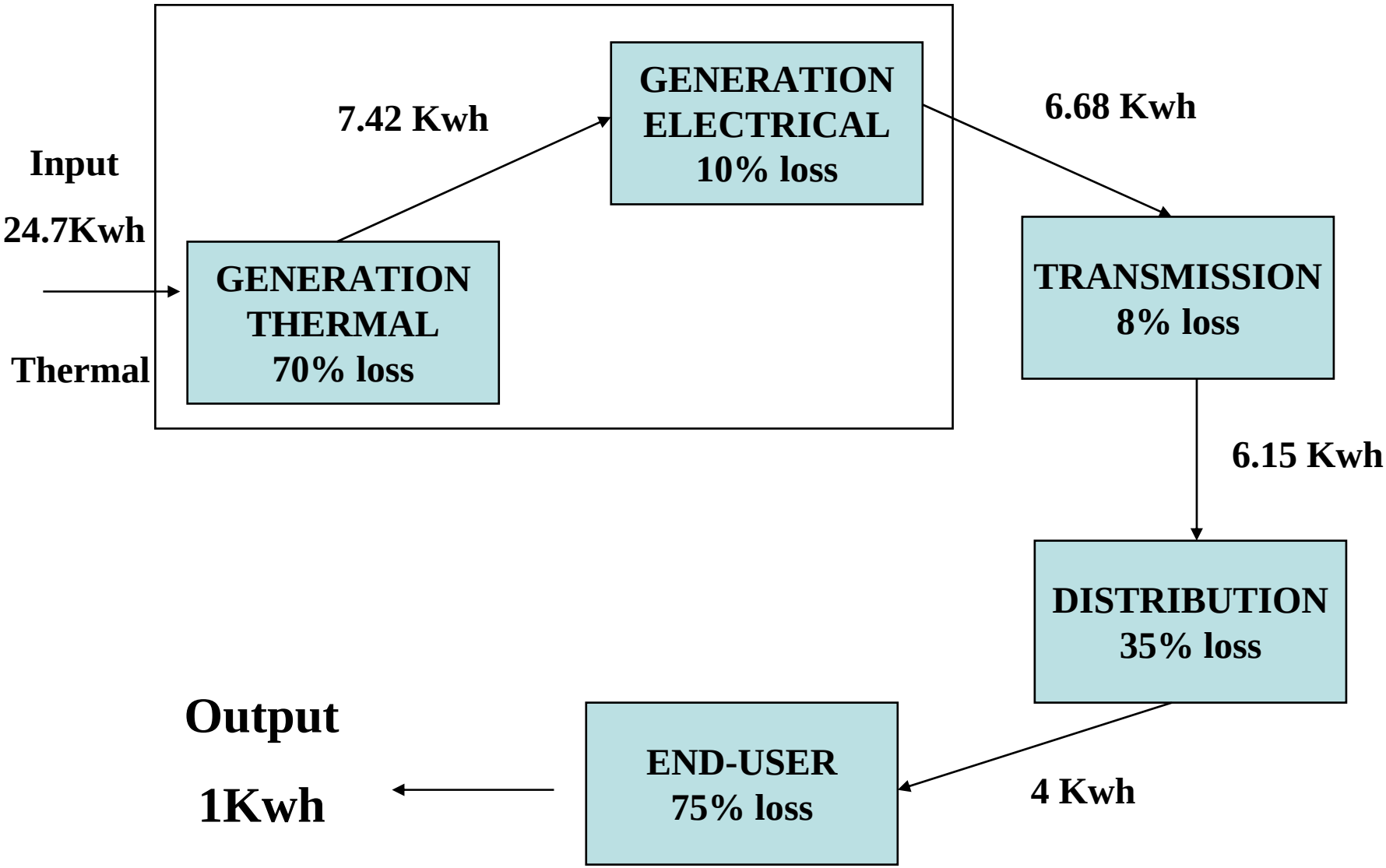

2000 Total water consumption: 552 bcm

2000 Energy Use Pattern

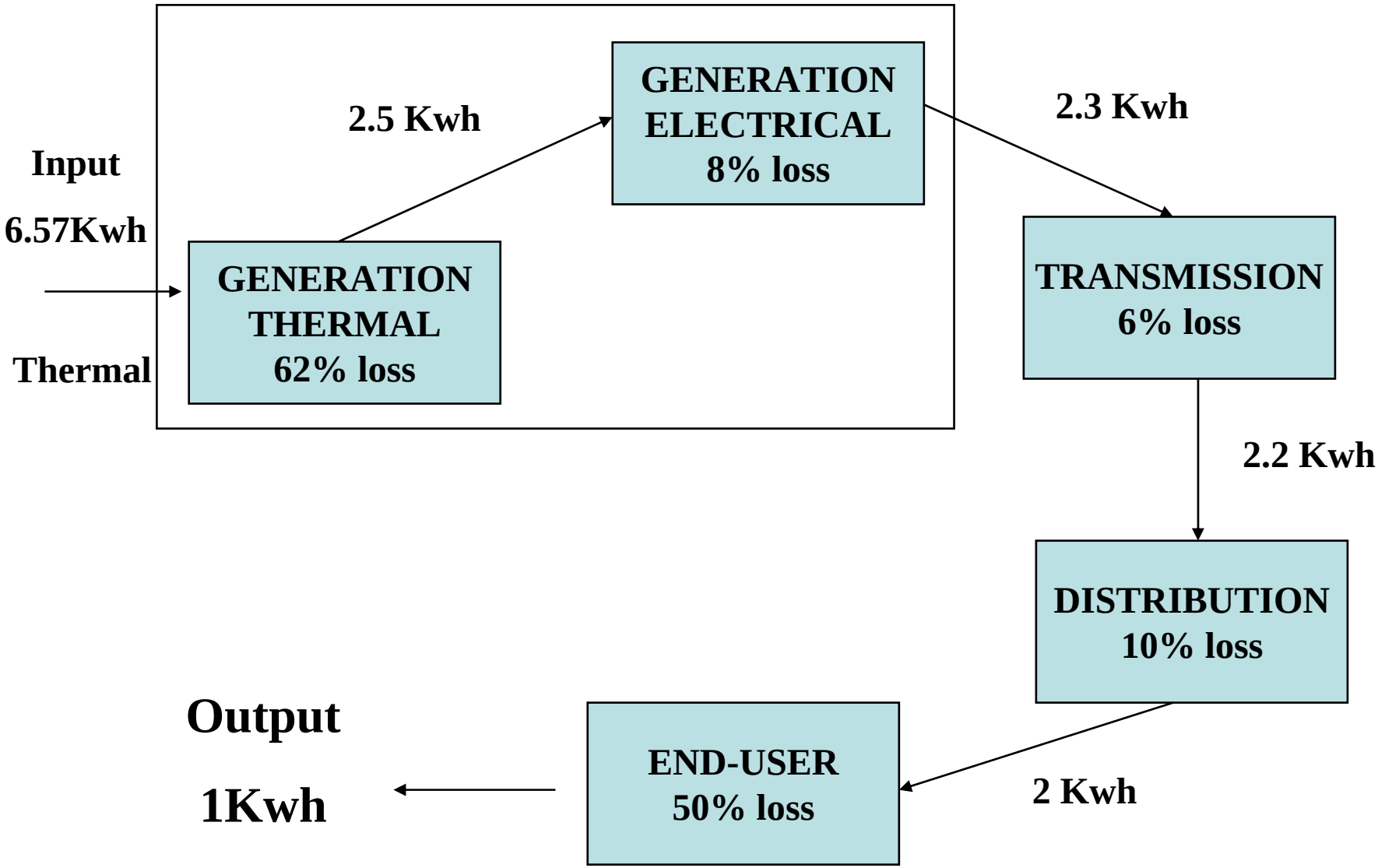



2000 Total Energy consumption = 395 billion kWh

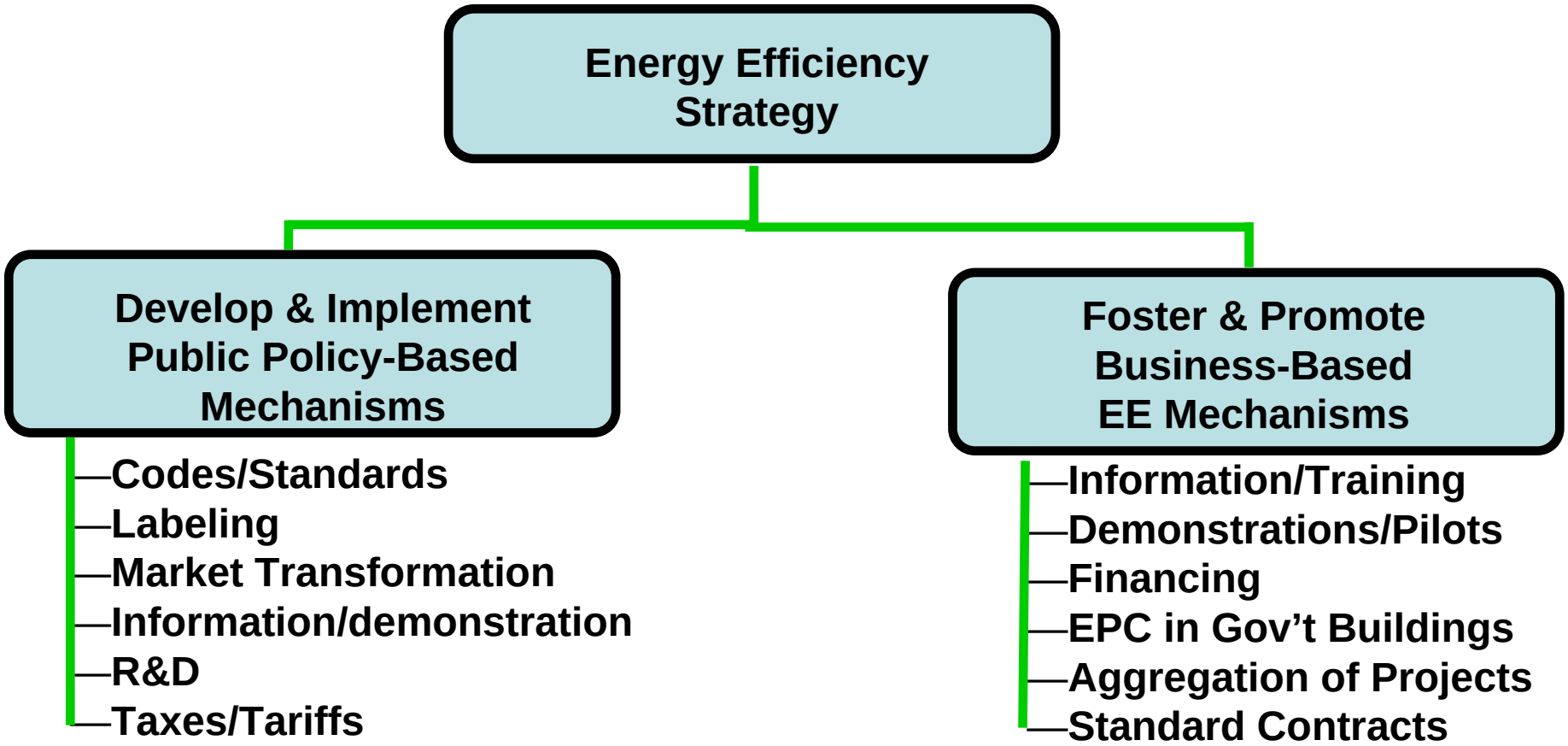
# PRINCIPAL TECHNICAL LOSSES - AGRICULTURAL SECTOR - INDIA



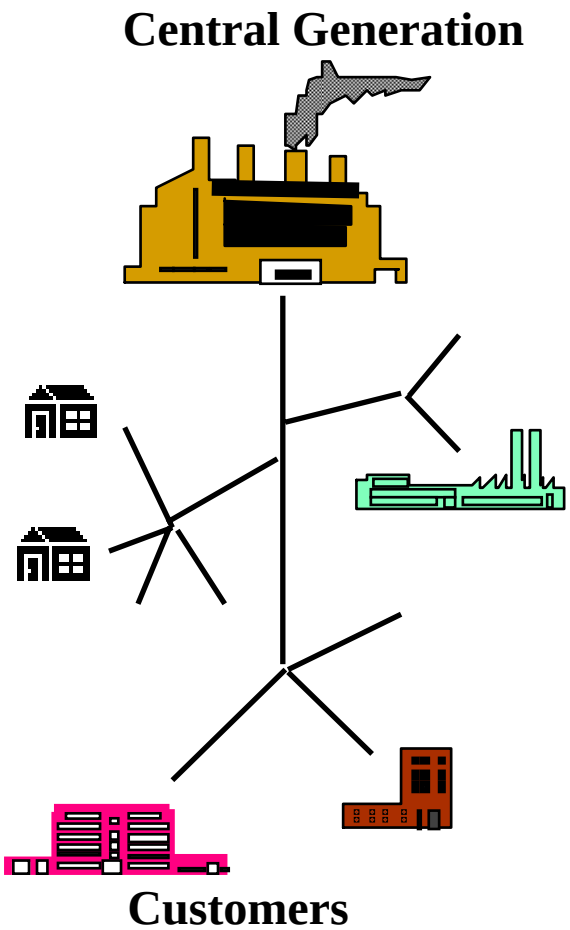
# PROBABLE TECHNICAL LOSSES - AGRICULTURAL SECTOR - INTERNATIONAL STANDARD



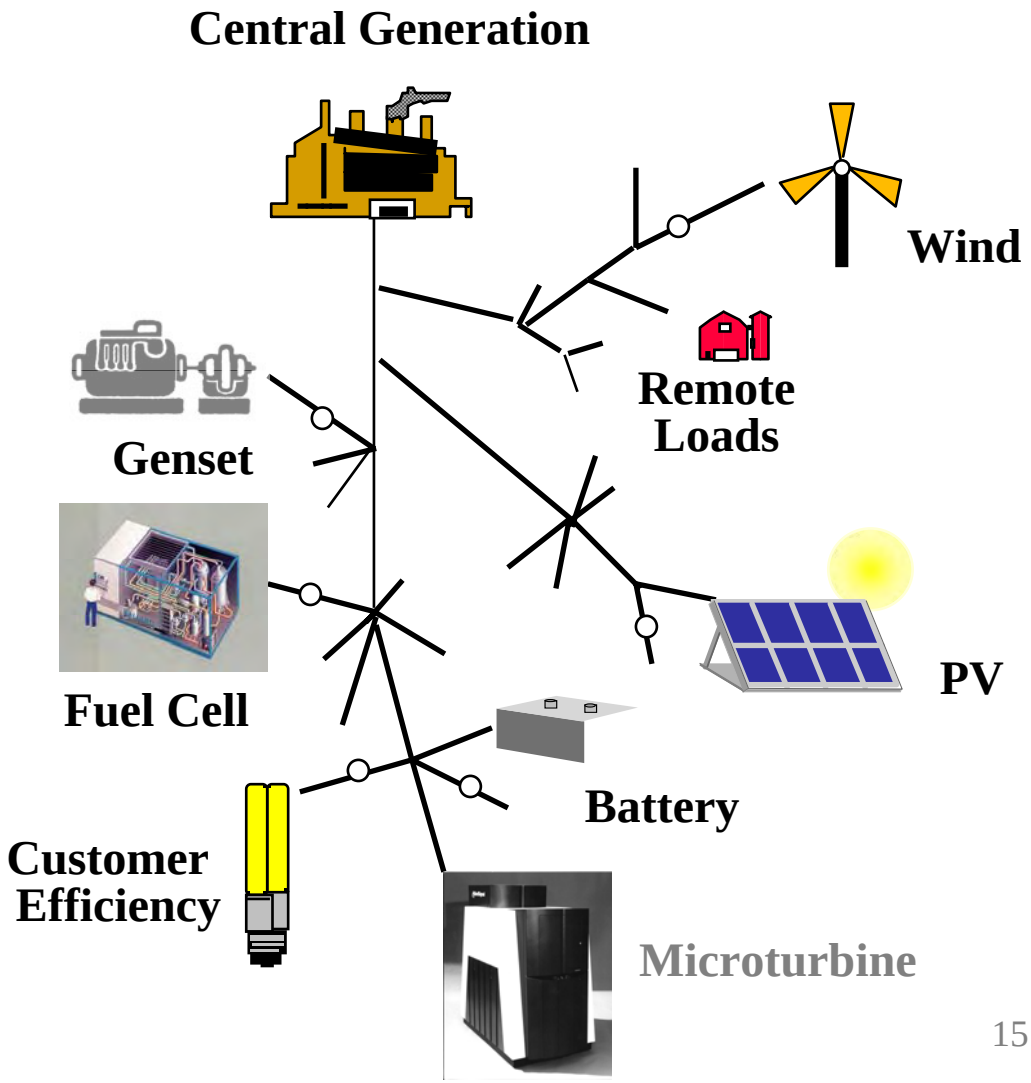
# Key Elements of Energy Efficiency Strategy



# Today's Central Utility




# Tomorrow's Distributed Utility?



# 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**