INTERNATIONAL REGULATORS' FORUM

MERC

"Enhancing Efficiency to Reduce Operational Costs for Competitive Tariff"

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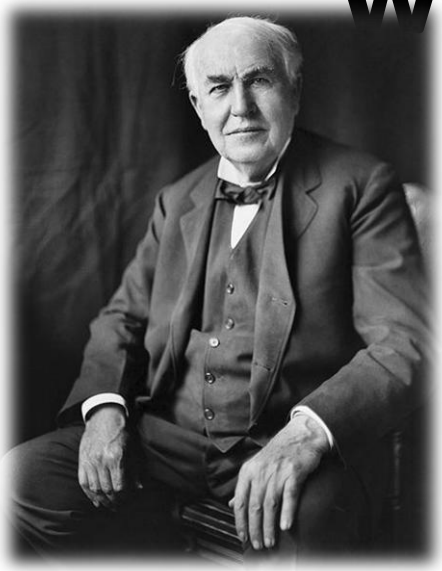
Member, MERC Mumbai
11th OCT. 2011

Edison's Dream

"We will make electricity so cheap that only the rich will burn candles"

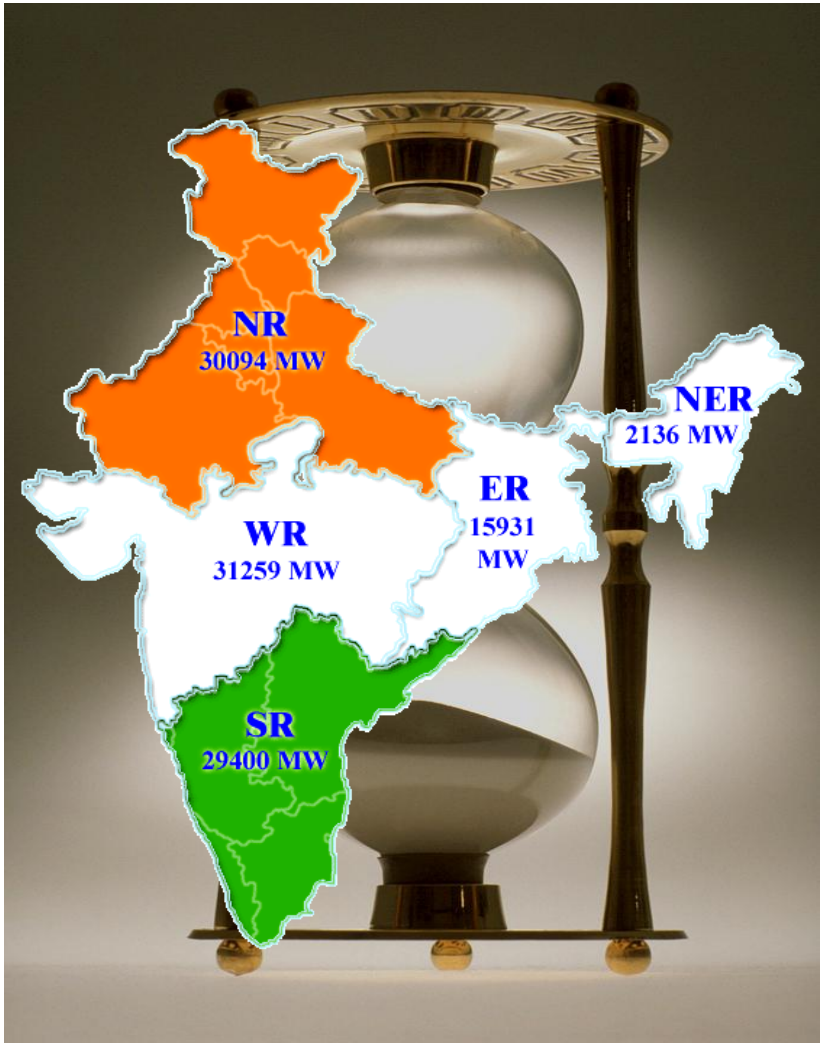


- Thomas Alva Edison

(1847 - 1931)

Enhancing Efficiency to Reduce Operational Costs for Competitive Tariff

Agenda…



- Indian/Maharashtra Power system: Basic issues
- Enhancing EE: Supply side & Consumer use side
- EE/DSM: Maharashtra Case studies : FTL/EE Fans/A.C.
- Reducing operational cost by Mumbai DR scheme
- EE/DSM Learning from US tour (June 2011)
- Conclusions

Indian Power Sector

- First power station commissioned at Darjeeling on 18th Nov 1898 (3x65 KW)
- No. of customers: Over 140 Million
- Revenue: Rs 350,000 CR/year
- Use: Industries: 42%, Domestic: 25%, AG: 24%, RLY: 3%
- Electricity Act 2003: Manifesto for Reforms
- India: 5th Largest electricity utilizing country next to USA, China, Japan, UK. By 2014 we will be fourth

Indian Power Sector: Challenges

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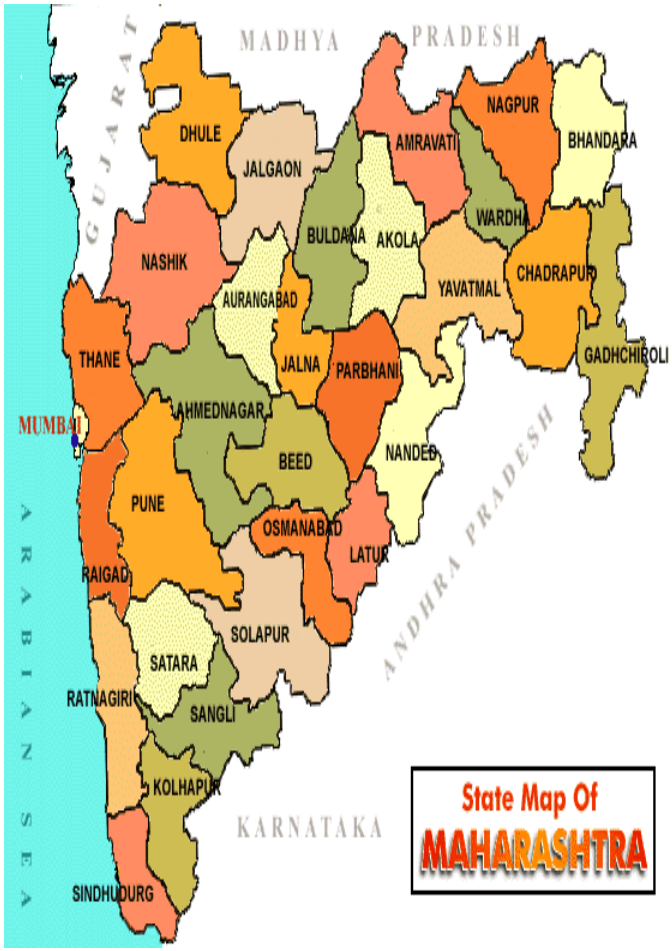
- High Dist Losses (about 25%
- Enhancing Efficiency of G/T/D Sector to Reduce Operational Costs for Competitive Tariff
- *Commercial viability of IND sector*
- Promotion of market (Competition)
- Promote DSM/EE activities/ RE Gen.
- Open access/ Parallel Dist Licensee/ Cross Subsidy Reduction

Maharashtra System

- Area :308,000 Sq. km, (112 M)
- <u>Daily Demand met: 325-355 MU</u>
- 4 DL, 3 GENCO, 4TRANSCO
- Dist Loss: Mumbai: 9.5% DL
- MSEDCL: Dist: 17.28% (17% LR:8 years)
- 400 KV Rings & 765 KV Network WIP
- DF at Bhiwandi/Nagpur & A'bad
- Mumbai Choice of DL for customers
- 21 Million Customers/2.5 Million Ag
- ARR: $ 10,000(+) Million
- Demand Growth: 8%



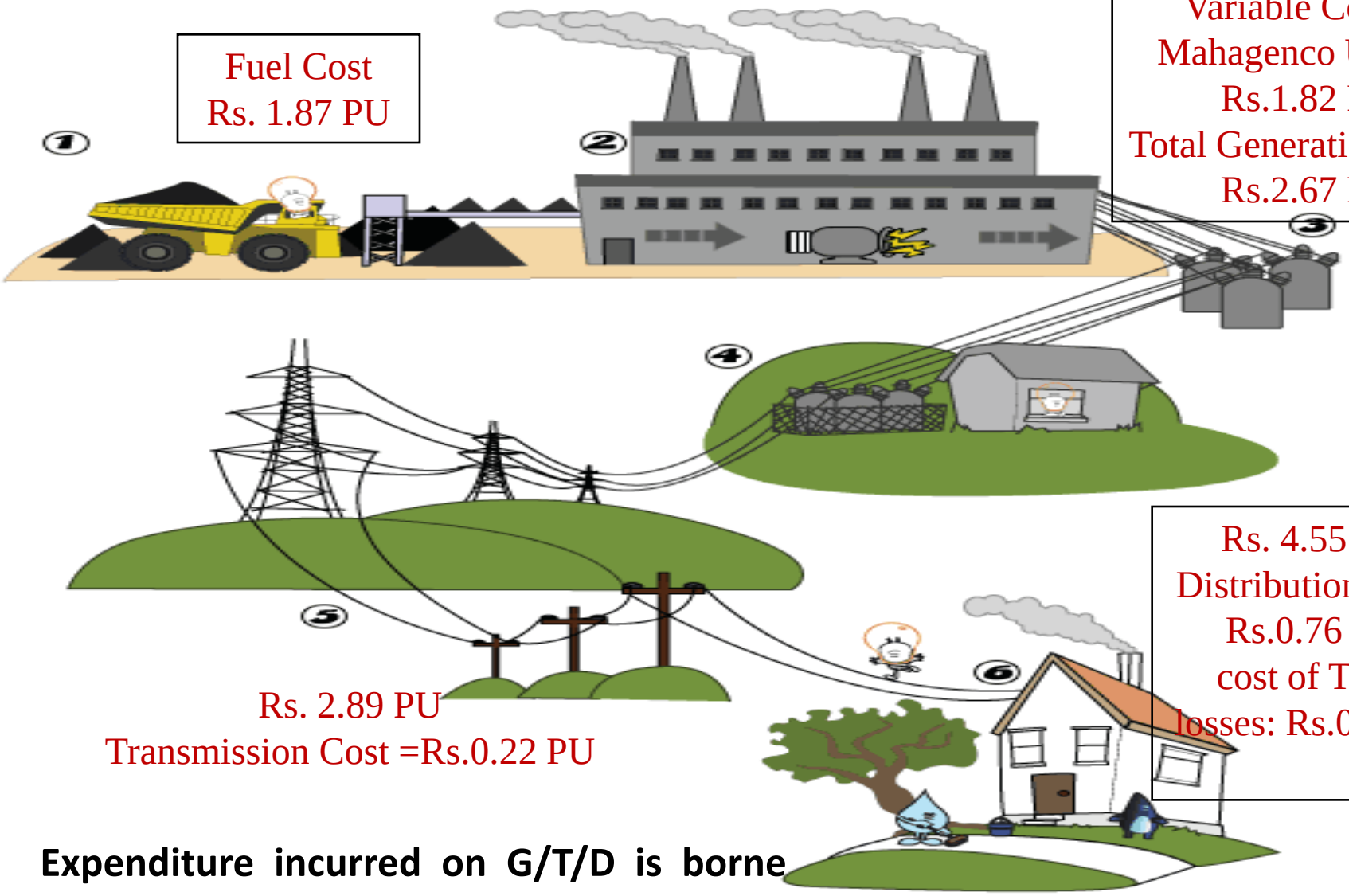
India: Population Census 2011

- **Population: 1210 Million (PA Growth: 1.76%) Literacy: 74%**
- **2.4% World Surface area & 17.5% population,(R) : 69% (U): 31%**
- **Population growth: 1951: 380 M 2011: 1210 M (3.2 times)**
- **Food grain growth: 1951: 51 MT 2011: 218 MT (4.3 times)**
- ***Young India: 50% Indians are below 25 years' age :*** **Employment generation: in IND & Service Sectors: top priority.**
- **These sectors are dependent on Power.**
- **If electricity tariff for IND sector is less, IND growth will give rise to more employment generation.**
- **Electricity pricing, growth of economy & employment generation are interlinked.** ***Regulators' Concern: Competative tariff***

Breakup of Electricity tariff (FY 2010-11)

Fuel Cost
Rs. 1.87 PU

Variable Cost of
Mahagenco Units =
Rs.1.82 PU
Total Generation Cost=
Rs.2.67 PU



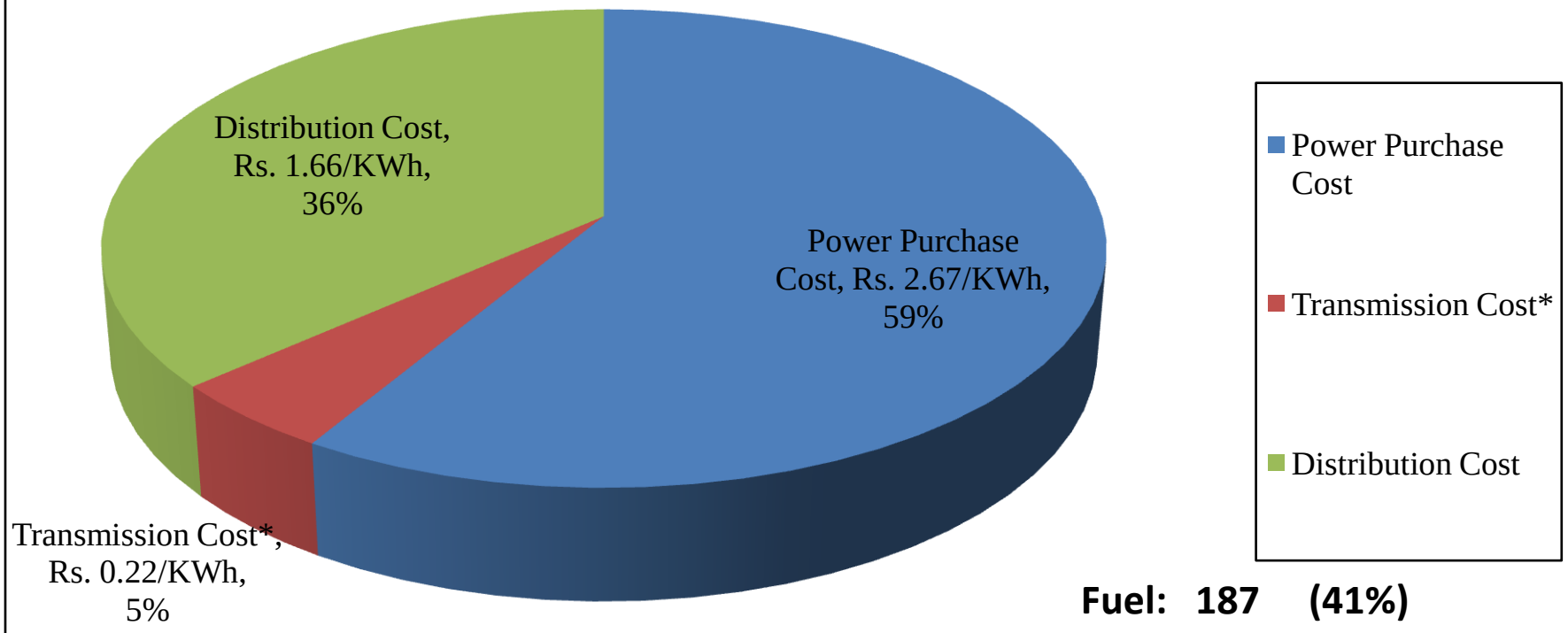
Rs. 2.89 PU
Transmission Cost =Rs.0.22 PU

Rs. 4.55 PU
Distribution Cost
Rs.0.76 PU
cost of T&D
losses: Rs.0.90PU

Expenditure incurred on G/T/D is borne by Dist Consumers through Retail Tariff

Breakup of Average Cost of Supply (tariff)

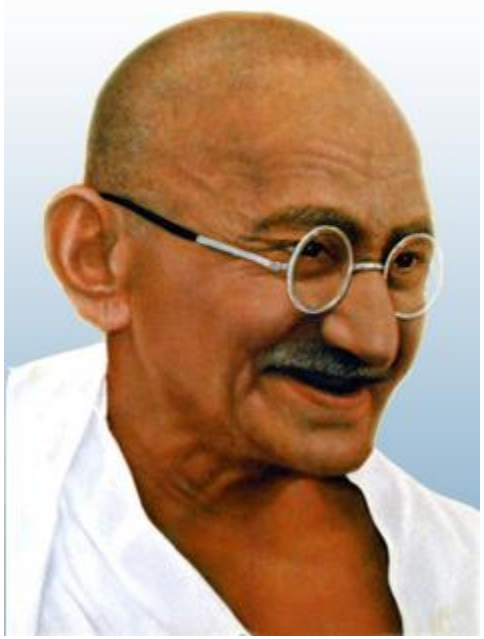
Average Cost of Supply (Rs. 4.55/kWh) for MSEDCL for FY 2010-11



Operational Cost: 59% Fuel cost: 41%

Fuel:	**187**	**(41%)**
Gen:	**80**	**(18%)**
Trans:	**22**	**(4%)**
Dist:	**76**	**(17%)**
T&D L:	**90**	**(20%)**
TTL:	**455**	

Thought for the Day…



"When Problem Persists,

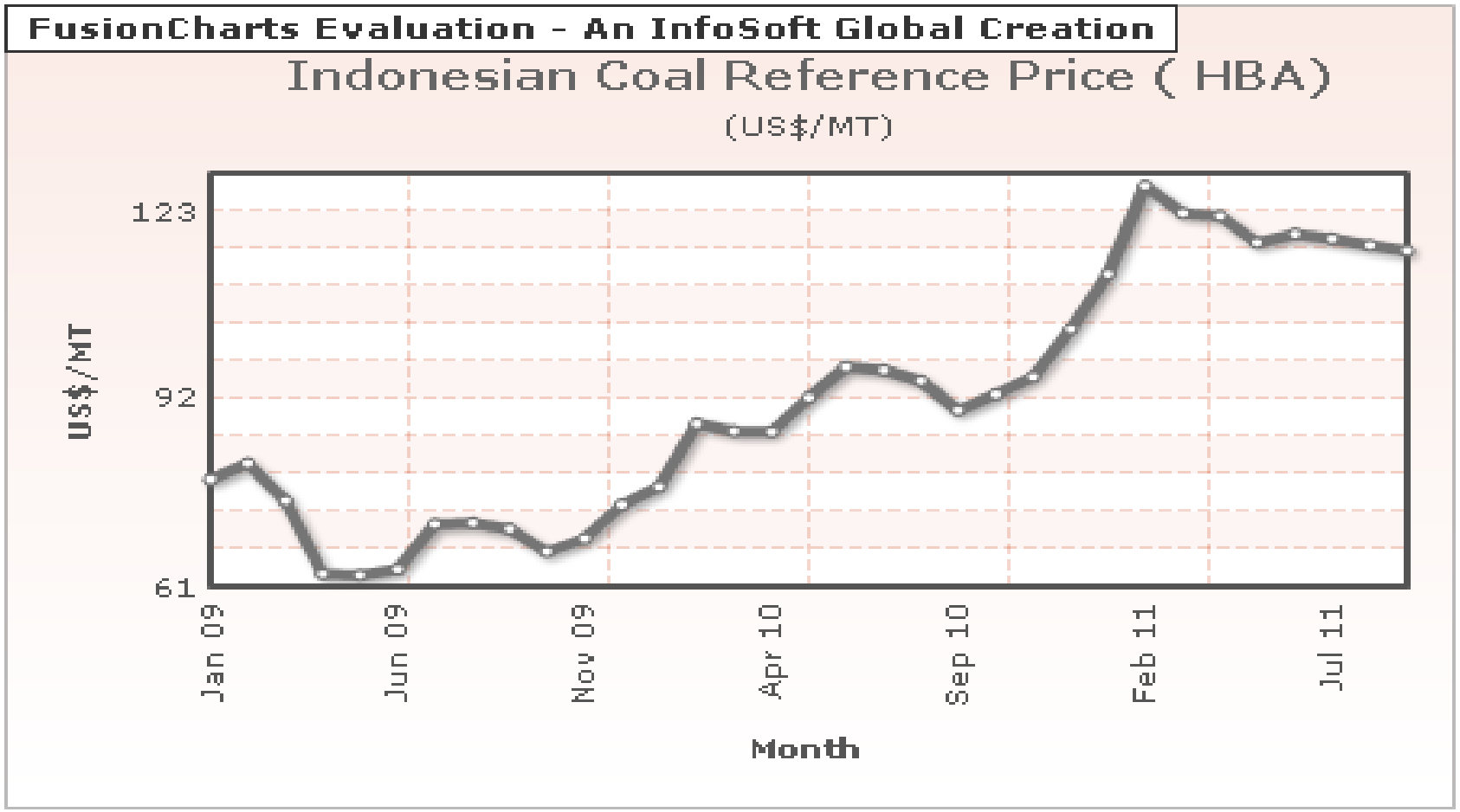
The Solution Exists"

Solution: Efficiency improvement

Thermal Power Plants: Factors affecting tariff…

- Increase in I/P cost for coal production & CPI/WPI
- CAPEX for new mines & modernization of existing mines for augmentation
- HI Coal Transit loss/ Coal theft in Gen Stations
- HI Auxiliary Consumption
- Higher consumption of Sec Oil
- Increased use of imported coal (15%)
- Hi Transit loss of Coal (Transportation)
- Loss of Coal fuel at GEN station Coal yards due to thefts & pilferages

Rising International Coal prices Indonesia



HIGH Dist. Losses

- Com. losses due to theft on L.T. O/H System
- High HT/LT ratio (1: 2.3)
- Loss on account of faulty meters
- Losses due to billing inefficiencies: EA
- Losses due to overloading of system
- Faulty/ Slow/ stopped meters: AMR/TOU
- Regular Theft Detection Drives: HVDS
- Distribution Franchisee
- IT Initiatives/ Accountability
- MSEDCL: 17.28% Mumbai System: <10%

Action Plan: Dist Loss Reduction

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“Meter Out”:

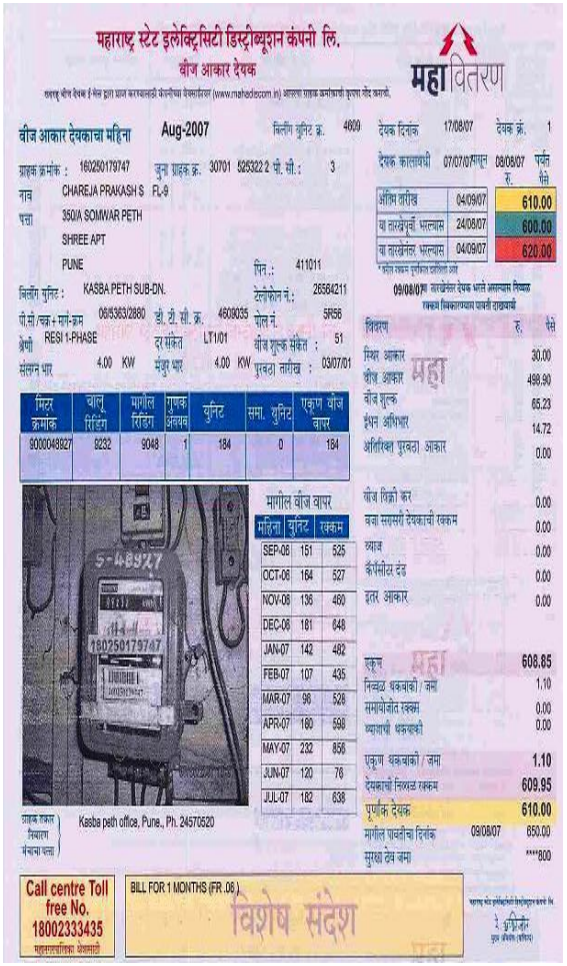
- Meter in box on outer wall of house
- Main service wire to be visible

HVDS : North American Practice:

- Replacing existing LT line with HT line & existing DT nearer to loads.
- Reduces Tech. loss & better VR
- In areas with theft and pilferage

Photo Metering: To ensure proper billing:

- Photograph of Meters taken &
- Image pasted on energy bill



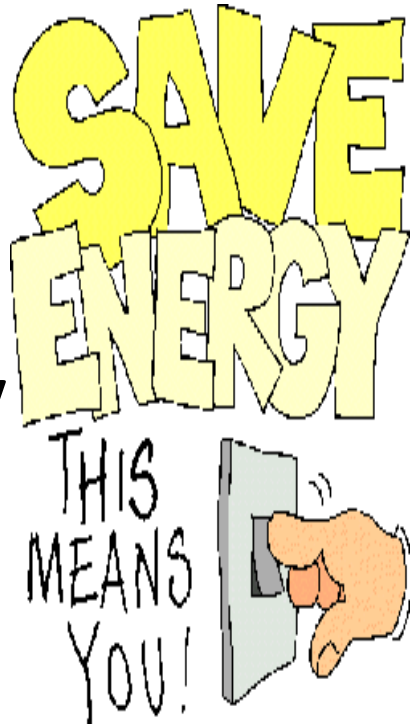
BEE Interventions: Reducing Energy Consumption

- 2002 BEE established. Appliance rating from Jan 2010
- Institutionalization of EE with market mechanism
- *Bachat Lamp Yojana:* to promote efficient lighting (CFL: 25% of ICL's consumption. Target: 6000 MW Gen capacity saving
- *Buildings*: EC Building Code launched in 2007 (new COM buildings with 500 KW CL)
- *Star rating of Appliances:* Thrust area of BEE: ceiling fans, TFL, DT, IND motors, A/C, Refrigerators
- *AG:* Replacing inefficient pump sets with EE Pump sets
- *Municipal sector:* EE Street lighting & PWW System

DSM: Action by utility: beyond Consumer's meter

- Capital Investment for TH PS: Rs 50 Million/MW
- Period for commissioning : 3-4 years
- Land/ Water/ fuel/ ENV & Forest clearances
- Unit saved is more than 1.5 Units generated

  Wastage can be avoided Improving EU efficiency
- Lack of consumer awareness though initial costs are lesser (Rs 15 Million/MW)
- Non-availability of EE equipments (market)



- ***Regulators: to undertake measures in Pricing, incentivizing DSM, Encouraging participation of ESCO & making EE information available to consumers.***

DSM Consultation Committee

- **MERC issued DSM Regulations & M&V Regulations 2010**
- **DSM CC: <u>Nodal agency for driving DSM & for recommending DSM programs for approval of MERC.</u>**
- **DSM CC: Secretary, MERC, Members : Representatives of all DL/ invitees from industry & Govt.**
- **Funding of DSM programs: being implemented by DL to be included in ARR**

DSM Pilot programs in Mumbai

- ***Fluorescent TL with electronic chock :*** **(Rs. 35 Million)**

  Replacing 150,000 T12/T8 (60W) with T5 (31W)

  (6 MU/Year saving). Rebate Rs.200 for Domestic &

  Rs.150 for COM Customer

- ***Ceiling fans:*** **(Rs. 11 Million)**
  - **Replacing 12,000 ceiling fans with EE 5 star Fans**
  - **0.66MU/year Saving**
- **Bulk procurement prices (including safe disposal of old units) at least 20% lower than market prices**
- **Higher warranties (utility-moderated) & utility rebate of close to 35% of first cost to consumers**

DSM Pilot Programs

- **Replacement of 600 Nos. Room A/C→EE 5 Star A/C (Rs.5 Million): 203KW savings, 0.57 MU/year**
- **Modification in Chiller system in Centralized AC: 2000 TR, Rs.13 Million**
- **Replacement of IC Lamp with CFL: Pilot scheme *implemented in Nasik City (380,000)*: 8 MW Load Relief**
- **Program for large central AC users:**
- **Rs. 5000/TR rebate for shifted load/Retrofit program launched**

Mumbai Load curve: Typical day

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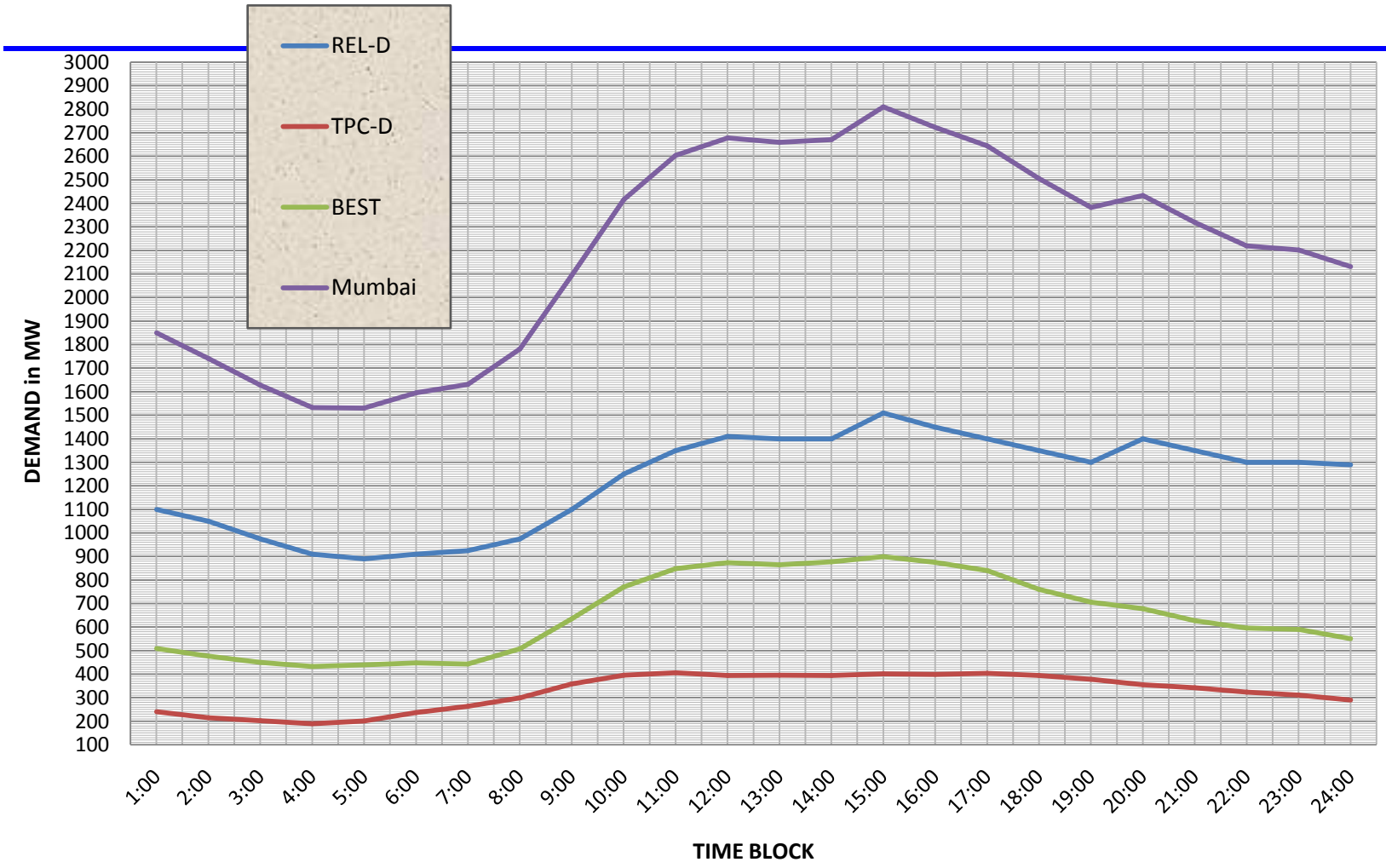
(For Mumbai Distribution Utility & Consolidated Mumbai)



DR Case study: Mumbai system

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- Peak load: 3200 (+) MW for 4-5 hours/day (1320 Hours/year)
- Base load: 1900 MW
- Mumbai (08-09) : PP Price: > Rs.15/KWH for 12 Hours
  Price > Rs.10/KWH for 678 Hours
  Price > Rs. 8/KWH for 1112 Hours
- Average Peak Power Purchase cost: Rs. 9.85/KWH.
- 10% Dist losses. Cost at consumer end: Rs 10.95/KWH
- Comm. tariff: Rs 5.55 – 6.00 /KWH
- Consumer Tariff lesser than Peak PP cost
- Peak A/C Load: 1000 MW. Centralized AC DEMD 100 MW
- Impact of ACOS for other consumers : Rs.0.20 PU

Demand Response: Mumbai SG Pilot

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- DR can be initiated, when power rates are high
- DL requests for Load relief from Service Provider (SP).
- SP enrolls customers ready to reduce loads, when requested, by collecting NEGAWATTS (unit of power no longer needed) & customer gets paid for not using energy at Peak time.
- SP informs the consumers 1 Hour prior to start of DR event, which may last for Max. 2 Hours
- 2.5 MU curtailment (25MWx100 Hours): (Rs. 45 M)
- DL to pay for saved energy to SP
- Consumer to receive rebate for saved energy from SP

AG DSM Project in Maharashtra

- 3 Million AG consumers: 16% customers , 25% sale and 10% Revenue
- Replacement of 3530 AG pumps on four 11KV feeders with EE star rating Pumps/ foot valve/ Capacitor Banks
- Observation during survey: most pumps were replaced by higher capacity pumps without informing DL
- Replacement completed: 2012 Nos. Balance WIP.
- EE Pump set: 25% cost more. 5 years maintenance. 39% efficiency improvement to be assured.
- EA of Pumps /Farmers' education: Van , workshop

Meeting with Dr. Arthur H Rosenfeld Grand father of EE on 8th June 2011

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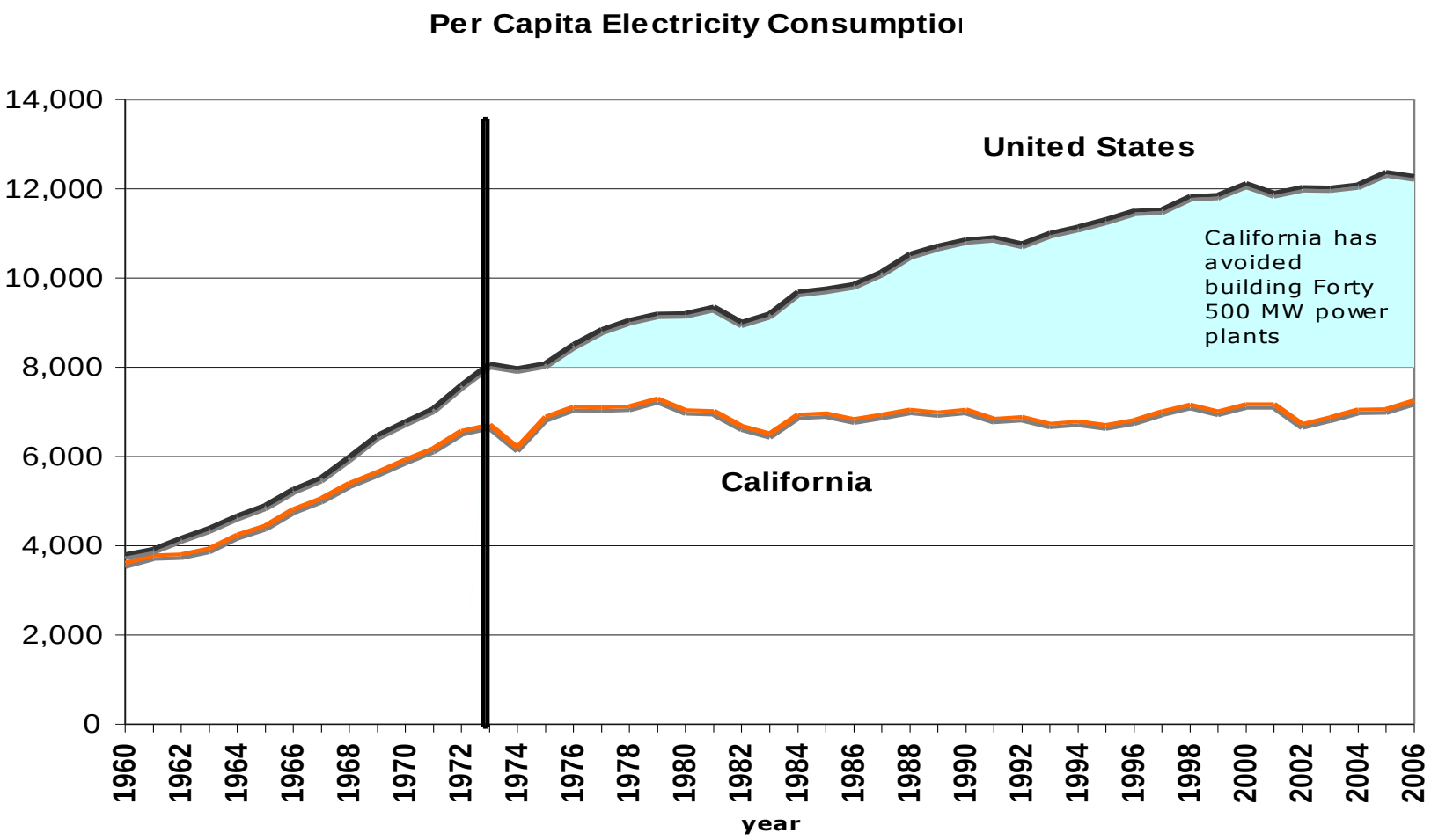
- Born in 1927. Ph.D. (PHY) in 1954 University of CA Berkeley
- From 1974 in LBNL: focus on EE
- 94-99: Sr. Advisor to US DOE's Assistant Secretary for EE/RE
- In 2000, Dr.AR: Commissioner at CEC. In 2005, reappointed
- Retired from CEC in Jan 10 Web site: www.artrosenfeld.org
- USA per capita pa consumption: 12000(+) U, for CA: 7000(+)
- 3% DEMD growth; 1.5%: by DSM/EE, 1.5% by RE
- EE Savings in 2010: 40% in lighting/ 10% HVAC/ 12% in Refrigerators/ 12% Buildings. EE Refrigerator: 1800 U→ 450U
- Dom. energy consumption due to TV rapidly increased from 3-4% in 1990s to 8-10% in 2008. EE TV being popularized

Golden Moment with Dr Arthur Rosenfeld

We will not forget in our lifetime

CA per capita consumption reduced



White roofs to cool our buildings, our cities & to cool the earth.

OLD

flat, white

pitched, white

NEW

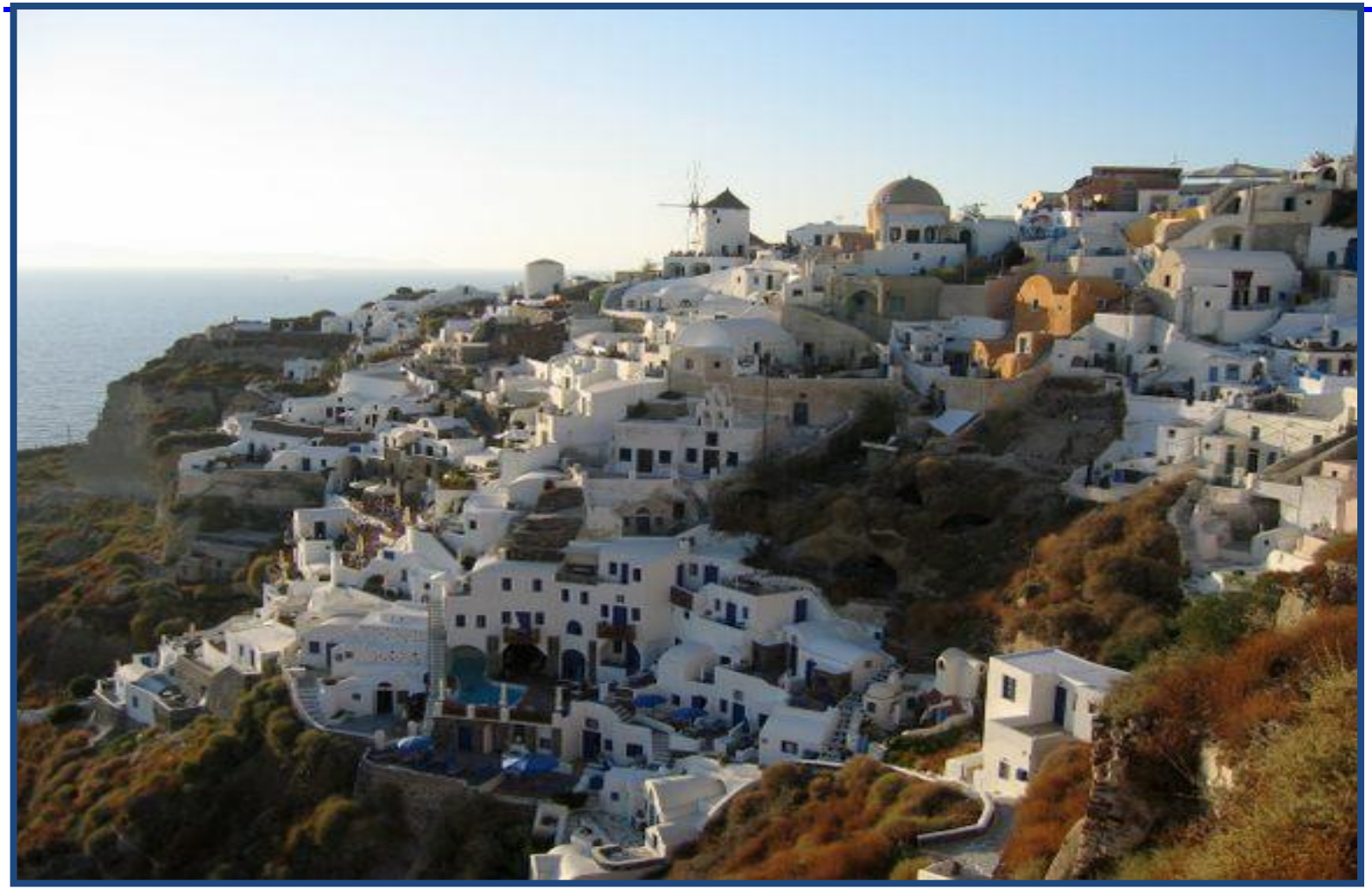
pitched, cool & colored

Geogle picture of Surface of Sacramento, CA shows:

- **20% roofs/30% vegetation**
- **40% pavement**

White roofs around the world…

in Santorini, Greece



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White roofs around the world…

In Hyderabad, India

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…and widely in the state of Gujarat, India.

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GLOBAL COOLING: making 100 m^2 (1000 ft^2) of gray roofing white offsets the **emission** of 10 Tonnes of CO_2

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Enhancing Efficiency: to Reduce Operational Costs for Competitive Tariff : Conclusions

- 70% of DL's Expenses: PP. 70% of GENCO's Expenses: Fuel
- Control Factors: Coal Transit Loss/ AUX use/ Sec Fuel use/ T&D LR (MSEDCL: Loss Reduction of 17% in last 8 years)
- For DLR: Meter Out/ HVDS/ Photo Metering /ABC/ AMR
- ***BEE: for institutionalization of EE/ Market development EEE***
- For reducing ENERRGY consumption: EE/DSM necessary
- DSM Regulations, M&V & DSM CC established by MERC
- To reduce Peak, DR program (SG) taken up in Mumbai
- Pilot AG DSM Project WIP: in Maharashtra
- CA's Per capita consumption gone down due to DSM
- DSM in US: Popular programs: EE Refrigerator Program/ EE TV
- Use of White roofs to cool roof: A/C reduces up to 15%

Finally…

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- CA's Per capita consumption gone down due to DSM
- DSM in US: Popular EE Refrigerator Program/ EE TV
- Use of White roofs to cool our roof: A/C reduces up to 15%
- <u>For reducing operational costs in retail tariff: It is essential to Enhance EE: FOUR SUCCESS PILLERS:</u>
- Sustained Govt. Policy & Support is necessary
- Adequate funding: Public & Private
- Technology & Programs: Continuous Improvement
- M& V of savings: Important but toughest activity
- <u>WE HAVE TO GO A LONG WAY!!!</u>

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“If it is to be It is up to me!!”

Thank You !!

(Contact me: vlsonavane@gmail.com)