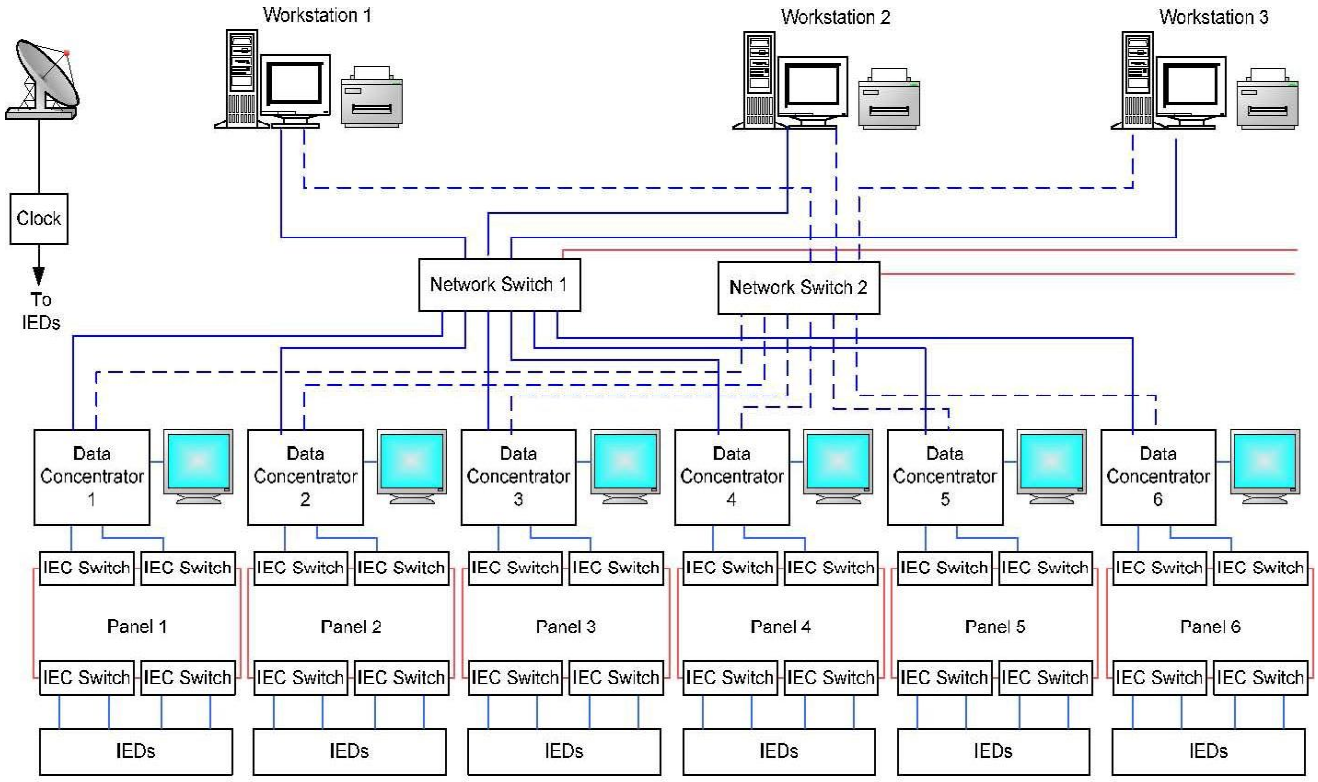
OTHER NETWORK CONSIDERATIONS

- Factors to be considered when Selecting Network Topology
  - Availability
  - Suitability
  - Initial cost
  - Lifetime Cost
  - Diagnostic ease
  - Data transfer rates
  - Protocol Dependencies
  - Network Segregation

- The network architecture implemented in the IGSTPP is a combination of ring and star topologies.
- The IEDs are linked to substation-rated managed Ethernet switches connected in a ring topology
- The number of IEDs, the network is divided into six Ethernet ring networks, with a data concentrator collecting IEC 61850 reports from approximately 100 relays.

Network Architecture at IGSTPP



Network Topologies

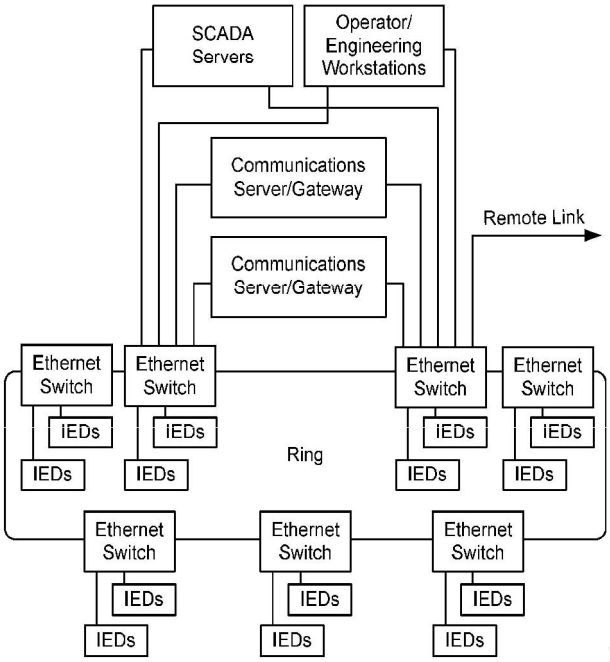


Fig. 11. Typical substation network with ring architecture

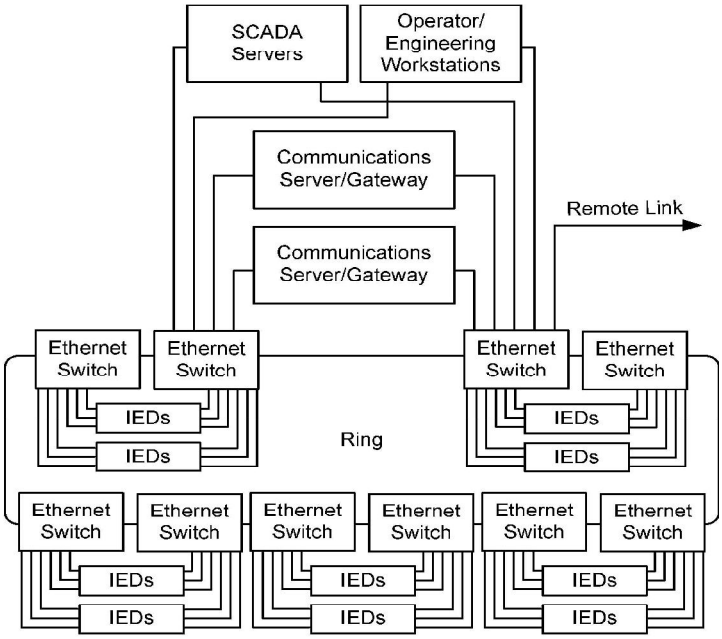


Fig. 12. Typical substation network with ring architecture and dual-port IEDs

Fault Trees

Designers can use fault trees to determine the Failure rate of a combination of components Given the unavailability of the components in a system, fault trees are useful to calculate the unavailable

Given the Unavailability of the components in a system, Fault Trees are Useful to Calculate the Unavailability of the system

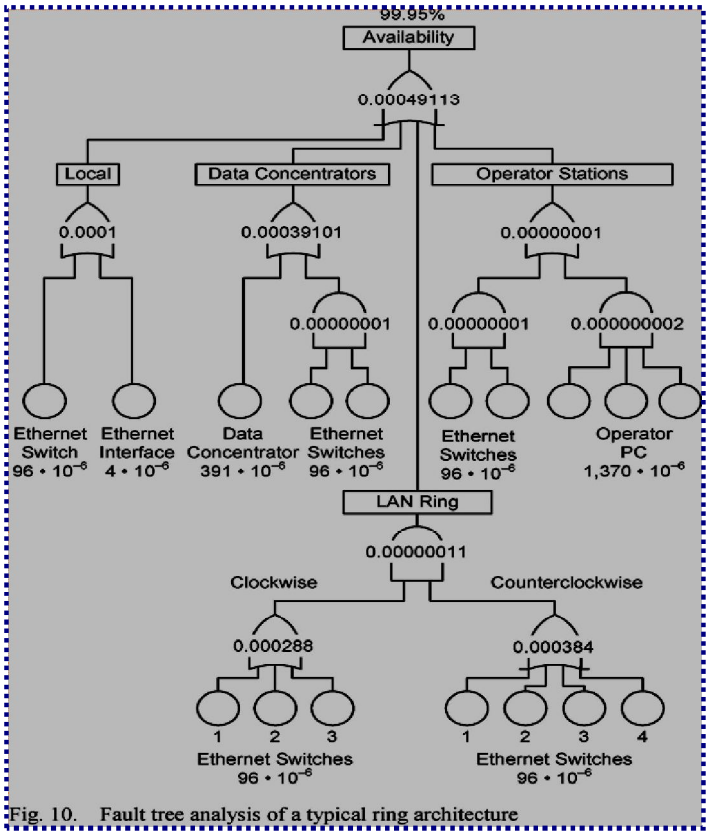


Fig. 10. Fault tree analysis of a typical ring architecture

RECOMMENDATIONS

- Message Prioritization
- Quality of service
- Network Segregation
- VLANs


Thank You

TABLE II
ELAPSED TIME FOR AN IEEE 802.3 FRAME TO TRAVERSE THE PHYSICAL MEDIUM [1]

Medium	Time to Traverse a Link
CAT 5e and CAT 6 cables	0.55 μs per 100 m
Glass fiber optics	0.49 μs per 100 m
Wireless	0.33 μs per 100 m

Smart Grid

A journey

into

Transmission Automation

Presentation by

Nutan Mishra

Manager

Load Despatch & Communication Department

PRESENTATION FLOW

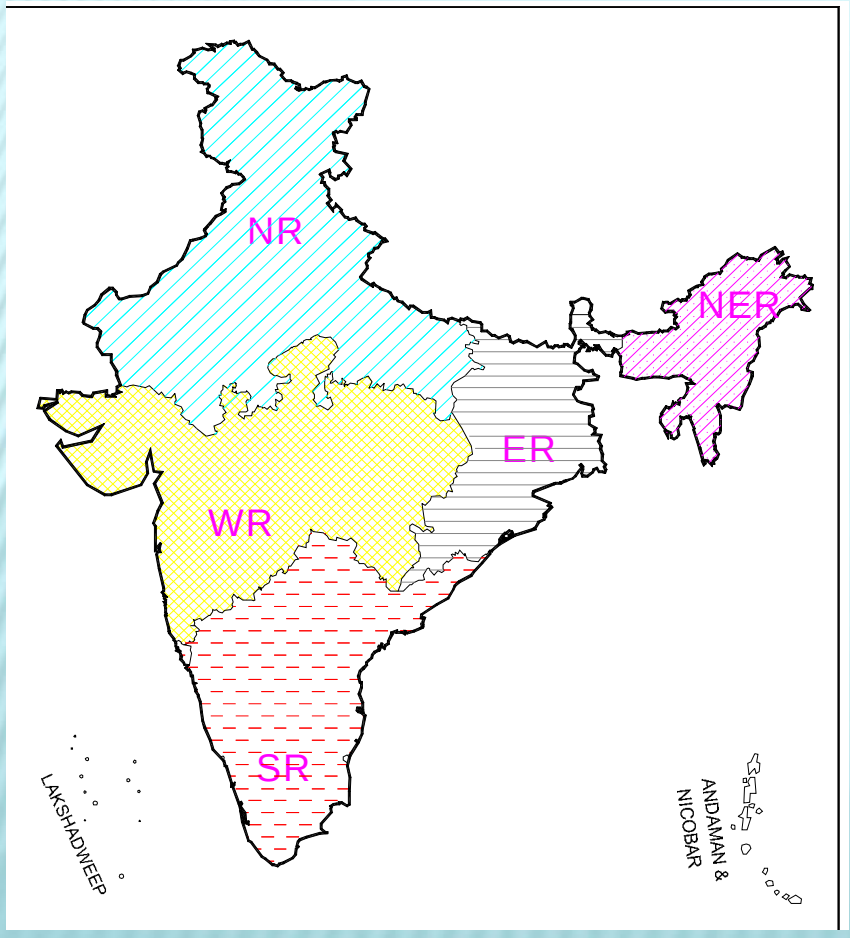
- POWERGRID
- Indian Power Sector - Overview
- Smart Grid
- Initiatives by POWERGRID
- About PMU & WAMs
- Road Map & Pilot Projects

POWERGRID

A listed Company with public holding of 13.64% and balance by Government of India.

- Conferred with Navratna status in May '2008
- Transmission Network (as on 31.12.2009)
  - about 73,950 Ckt. Kms.,
  - 124 Sub-Stations,
  - about 82,100 MVA
- Carries about 45% of Country's electric power
- Network availability > 99%

Present Power Scenario



Installed Capacity – 156,092 MW

Peak Demand: 111,000MW

Peak Deficit – 12%

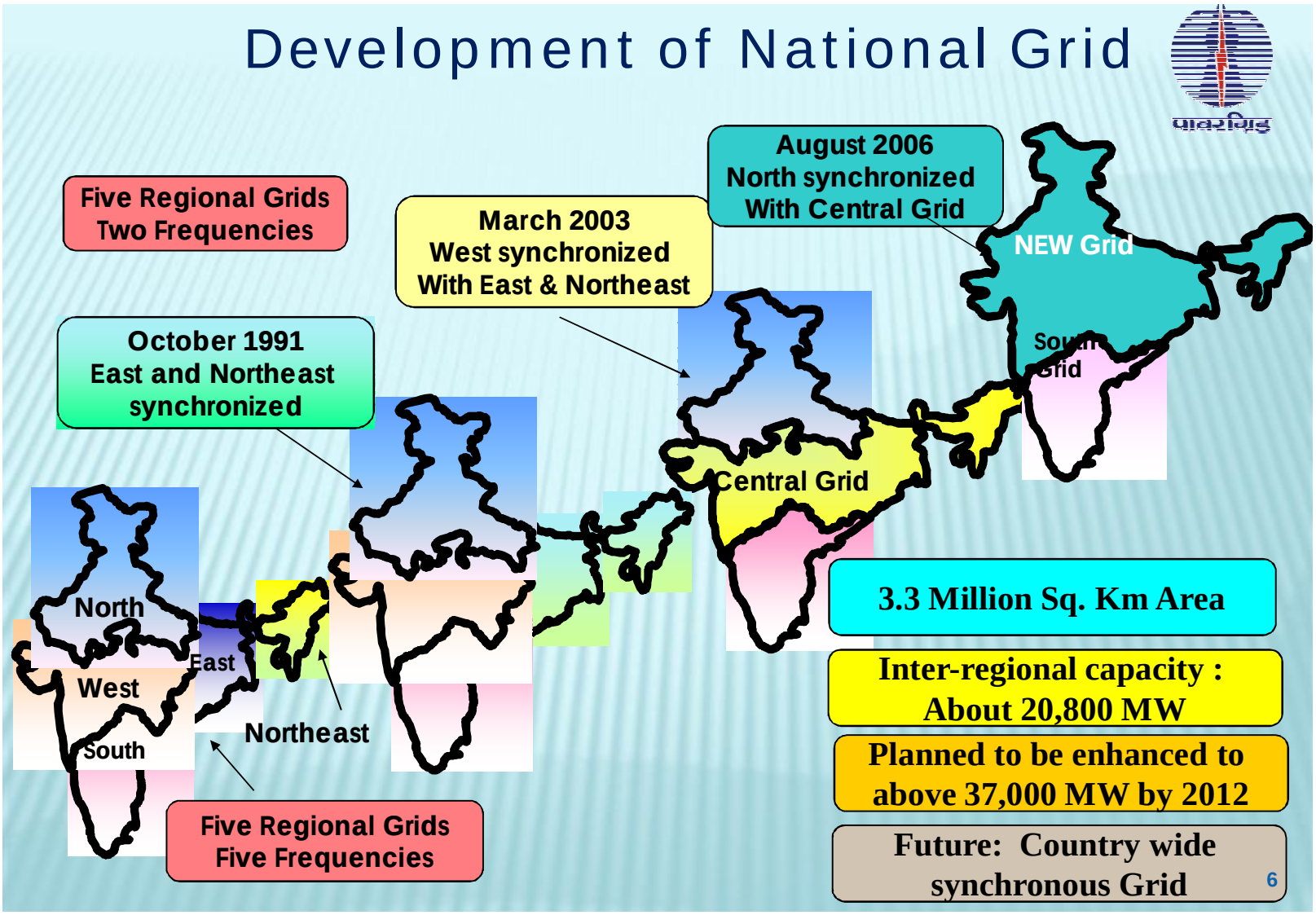
Energy Deficit – 11%

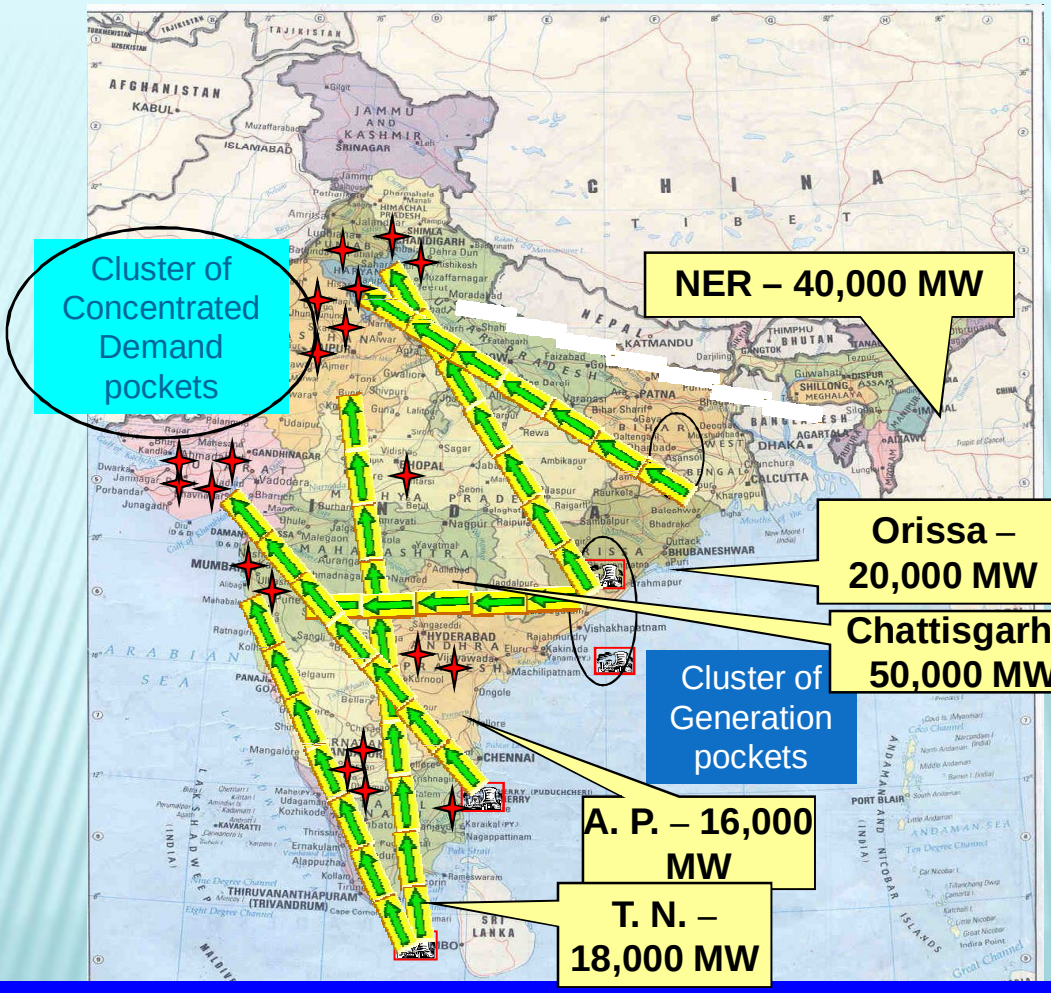
Per Capita consumption –672 unit

Growth rate – 8% per annum

Source:
Powerline
(Siemens Ad),
Oct-2006

Development of National Grid





Bulk Power transfer over long distance through Strong National Electricity Grid necessary

STRENGTHENING OF NATIONAL GRID

- Development of National Grid on continual basis with sufficient inter-regional power transfer capacity
- Planned to enhance the capacity progressively to about 75000 MVA by 2017.