

# The Future of Distribution Systems in the Deregulated Environment: Opportunities and Challenges

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# Presentation Outline

- ❖ What is an Ideal Distribution System?
- ❖ Historical Perspective
- ❖ Current Dilemma
- ❖ Emerging Future: Driving forces
- ❖ Grand Challenges for Next Decade
- ❖ Grand Challenges Beyond Next Decade

# What is an Ideal Distribution System?

- Total Control of Personal Power
- Wireless power
- Zero emissions for Distributed Resources
- Self - Healing - Zero outages
- Zero distribution Loss
- Zero supply deficiencies
- Zero distortion power

# Historical Perspective

- Most Attention on Bulk Systems
- Capital Intensive
- Benign Neglect
- Poor Planning
- Inefficient Operation
- No Cost Consideration

# Current Dilemma

- ❖ Deregulation or Re-regulation is a Fact
- ❖ Electricity is Expensive
- ❖ Global Demand Increasing
- ❖ National Economic Growth
- ❖ Population Growth
- ❖ Better Awareness of Public
- ❖ Higher Expectations from Customers

# Emerging Future

- **Systems Will Become More Complex**
- **Adapt to Changing Culture**
- **Driving Forces**

# Driving Forces

- ❖ Diverse Market Issues
- ❖ Regulatory Issues
- ❖ Technological Issues

# Diverse Market Issues

- ❖ Large Industrial Customers Need
  - ❖ High Reliability and Power Quality
- ❖ Residential Customers Want
  - ❖ Low-Cost Energy
- ❖ Distribution Companies Need:
  - ❖ Stay Competitive

# Regulatory Issues

- Obligation to **Protect** Interests of
  - **People**
  - **Small and Large Businesses**
  - **Environment**
- **Federal Energy Regulatory Commission**
- **Public Utility Commissions (State)**

# Technological Issues

- Distributed Resources (DR) Integrated into Distribution Network
- EPRI estimates that by the year 2010 25% new generation would be DR
- New Communication and Information Technologies

# Grand Challenges for Next Decade

- Optimum Planning and Automated Operation
  - Var Support
  - Reliability and Power Quality
  - Efficiency Improvement
  - Integrated Sensing, Monitoring and Control

# Grand Challenges for Next Decade

- Information Technology Needs
  - Data Collection, Mining and
- Distributed Resources Integration
  - Protection
  - Interface with Different Frequency Equipment
- Meeting Federal & State Standards

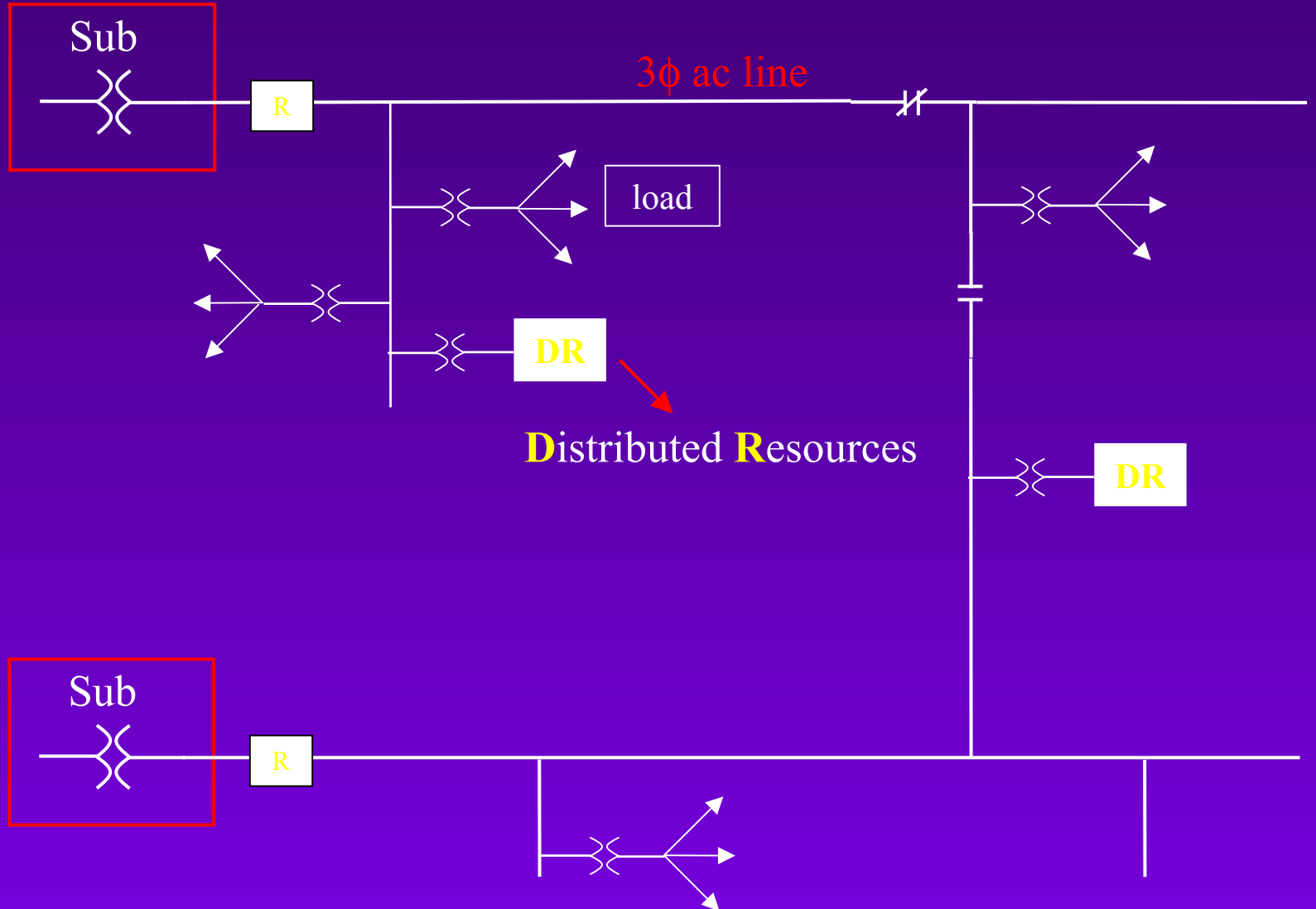
# Grand Challenges Beyond Next Decade

- ❖ Systems will Become Even More Complex
- ❖ No Power Quality Problems
- ❖ Zero Interruption Supply
- ❖ Why Sinusoidal Systems?
- ❖ Totally Independent Customer Owned Systems?
- ❖ Why Distribution be Radial?

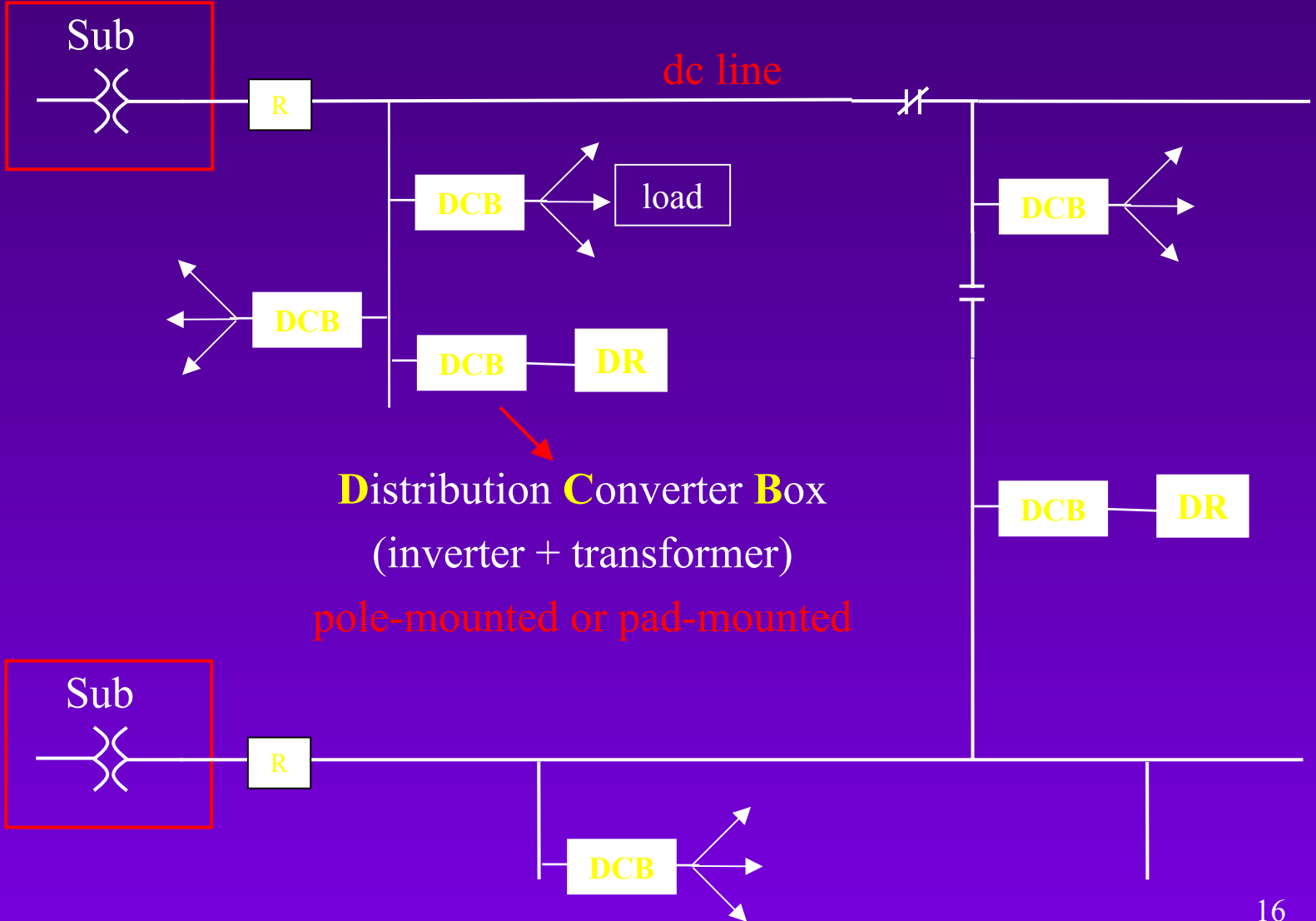
# A Radical Proposal

- Primary distribution in dc
  - System impervious to power quality problems
  - Local reactive power support
  - Improved performance of DR due to freedom from frequency restrictions
- Problems
  - dc protection devices are complicated

# Current Topology



# Radical Topology



**Distribution Converter Box**  
(inverter + transformer)  
pole-mounted or pad-mounted