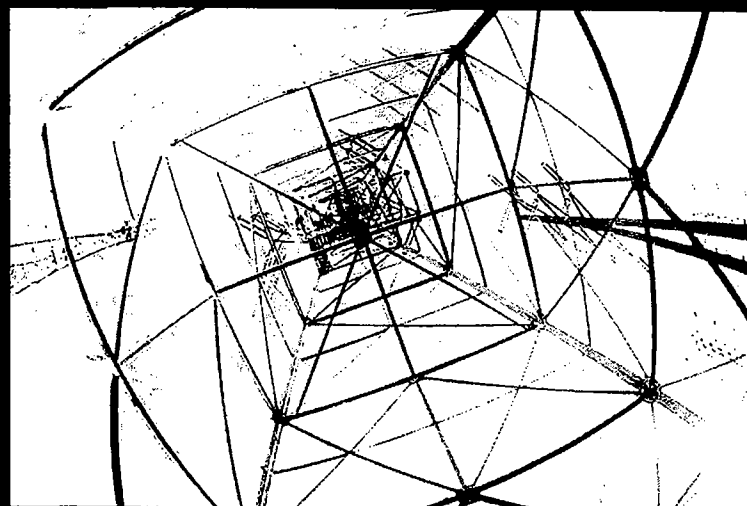


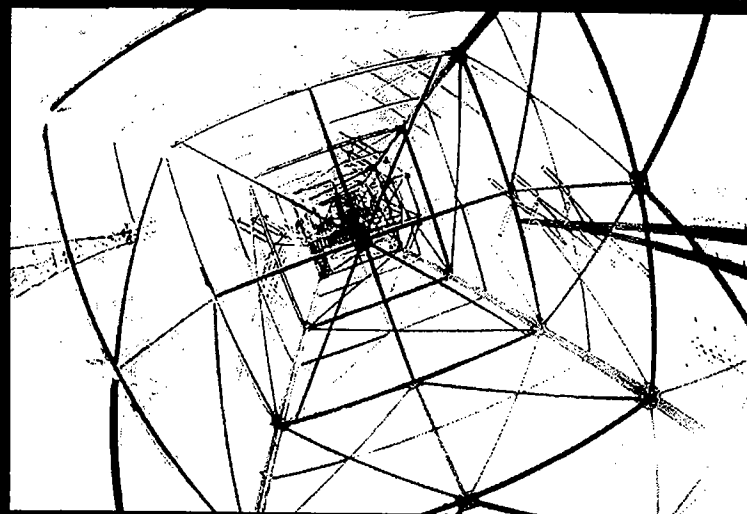


## ***Electric Industry Overview***





## ***Electric Industry Overview***



# Overview of the Electricity Industry

Georgia Public Service Commission  
January, 2004

# Outline

- ◆ Historical Synopsis
- ◆ Industry Features
- ◆ Regulatory Authority
- ◆ Recent Developments

# Historical Synopsis

- ◆ The Beginning – 1882
- ◆ Pearl Street Station in New York City
- ◆ Thomas Edison
- ◆ Central Station generation unit using a steam engine
- ◆ Direct current
- ◆ Limited transmission and distribution

# Historical Synopsis

- ◆ The Purpose of the First Electricity Companies (circa 1890)
- ◆ Built for dedicated uses such as the supply of electricity to ice plants, trolley cars, and cotton gins
- ◆ Home and business use of electricity was restricted to evening and night hours

# Historical Synopsis

- ◆ Early Competition in Electricity
- ◆ Two or more electricity companies competed for the same urban customers
- ◆ No one competed for rural customers
- ◆ There was no electricity in rural areas until the enactment of the Tennessee Valley Authority Act of 1933 and the Rural Electric Cooperative Act of 1935

# Historical Synopsis

- ◆ Technological change
- ◆ Recall that the first central station generation plant produced direct current, which could not be transmitted over great distances
- ◆ Tesla invented an alternating current system of electricity using a polyphase system



# Historical synopsis

- ◆ The advantage of a polyphase alternating current system is that it allows AC electricity to be transmitted over large distances because transformers are possible
- ◆ Transformers can transform electricity to high voltages for transmission and then back down to lower voltages to be used

# Historical Synopsis

- ◆ Prior to 1935, holding companies were the dominant corporate structure
- ◆ Municipalities and then states granted exclusive franchise areas
- ◆ Early competition died
- ◆ AC technology that allowed for transmission over longer distances also made larger generation plants possible
- ◆ Economies of scale for generation and transmission

# Historical Synopsis

- ◆ Samuel Insull and the period of consolidation – Insull, the father of holding companies
- ◆ The good of holding companies – included economies of scale, to the extent that holding companies were a single integrated operating system

# Historical Synopsis

## ◆ The Evils of Unregulated Holding Companies:

- Pyramiding
- Abusive affiliate transactions
- Joint and common cost misallocation
- Use of the electric utility subsidiary as both a cash cow and as a source of collateral for upstream loans

# Historical Synopsis

- ◆ By 1932, the eight largest electric utility holding companies had control over 73 percent of electricity generated by investor-owned utilities
- ◆ Holding companies owned electricity companies in non-contiguous areas throughout the United States

# Historical Synopsis

- ◆ An economic downturn caused a collapse of the holding companies, which because of financial abuse (not unlike Enron) was like a financial house of cards.
- ◆ The economic downturn cascaded into the great depression (other causes included bad bank loans, speculation / insider trading / abuse in the stock market, the great drought / dust bowl)

# Historical Synopsis

- ◆ In 1935, Congress reacted by passing both the Public Utilities Holding Company Act and the Federal Power Act
- ◆ The PUHCA was enacted:
  - First, to limit the size of holding companies
  - Second, to discourage non-contiguous holding companies
  - Third, to prevent holding company abuse

# Historical Synopsis

- ◆ The PUHCA empowered the Security and Exchange Commission to regulate the financial and corporate activities of registered (non-exempt) holding companies
- ◆ From 1935 to 1945, the PUHCA guided the realignment of the U.S. electricity industry into a collection of vertically-integrated electricity companies



# Historical Synopsis

## ◆ The Federal Power Act

- Created the Federal Power Commission that later became the Federal Energy Regulatory Commission
- Sets Wholesale Electricity Rates (Sale for Resale)
- Sets Transmission Service Rates (for Transmission Service in Interstate Commerce)

# Historical Synopsis

- ◆ Economies of Scale
- ◆ Falling Prices
- ◆ Adequate Profits
- ◆ From 1945 to Perhaps 1968
- ◆ Considered the Golden Age of Regulation

# Historical Synopsis

- ◆ The Northeast Blackout in 1965 firmly established the need for inter-utility coordination in the United States
- ◆ In 1968, the National Electricity Reliability Council was formed to assure electricity reliability throughout the United States

# Historical Synopsis

- ◆ The crisis decade from 1968 through 1978
- ◆ Oil embargo & natural gas shortages
- ◆ Increased costs of fuel
- ◆ Rate pancaking
- ◆ Fuel adjustment clauses
- ◆ Inflation led to increased cost of capital
- ◆ Overbuilding based on historical growth rates of 7 percent instead of 2 or 3 percent.

# Historical Synopsis

- ◆ 1978 to 1992
- ◆ Three mile island in 1978
- ◆ No new nukes were begun
- ◆ Construction cost overruns on completed plant
- ◆ Capacity phase-ins
- ◆ Prudence reviews and disallowances

# Historical Synopsis

- ◆ The Fuel Use Act of 1978 prohibited construction of new natural gas electric power plants
- ◆ The Public Utility Regulatory Policies Act of 1978 (PURPA) initiated rate reform
- ◆ More significantly, PURPA introduced the qualifying facility (QF) to the industry

# Historical Synopsis

- ◆ QFs (cogenerators and small renewable power producers) were given special treatment
- ◆ QFs were allowed to sell electricity directly to their host utilities
- ◆ The host utilities could not refuse to purchase this electricity

# Historical Synopsis

- ◆ The host utility was required to purchase this electricity at its own (the host utility's own) avoided costs
- ◆ QFs also directed attention to the interconnection of generation units that were not owned by the utilities
- ◆ QFs also introduced net billing



# Historical Synopsis

- ◆ QFs paved the way for independent power producers and exempt wholesale generators
- ◆ QFs proved that non-utility generation could be connected to host utilities without necessarily damaging electric reliability

# Historical Synopsis

- ◆ The Energy Policy Act of 1992 (EPACT) introduced Exempt Wholesale Generators (EWGs) into the electricity industry
- ◆ EWGs are legislatively authorized Independent or Affiliated Power Producers that sell power into the wholesale power market
- ◆ EWGs can use fossil fuels, such as natural gas

# Historical Synopsis

- ◆ EWGs do not have to cogenerate
- ◆ EWGs do not have to use renewable energy sources
- ◆ EWGs can be unregulated affiliates of registered holding companies
- ◆ EWGs allow all utilities to own unregulated generation units that sell into the wholesale market

# Historical Synopsis

- ◆ EWGs means that the electricity industry has come full circle
- ◆ EWGs are exempt from the PUHCA requirement that a registered holding company be a single, integrated, and contiguous system

# Historical Synopsis

- ◆ EPACT also provide for open access to transmission for generating units
- ◆ FERC issued Order 888 that required all regulated utilities (and non-regulated utilities seeking reciprocity) to file a pro forma tariff that provides for open access and comparable interconnection for generation units not owned by the utility

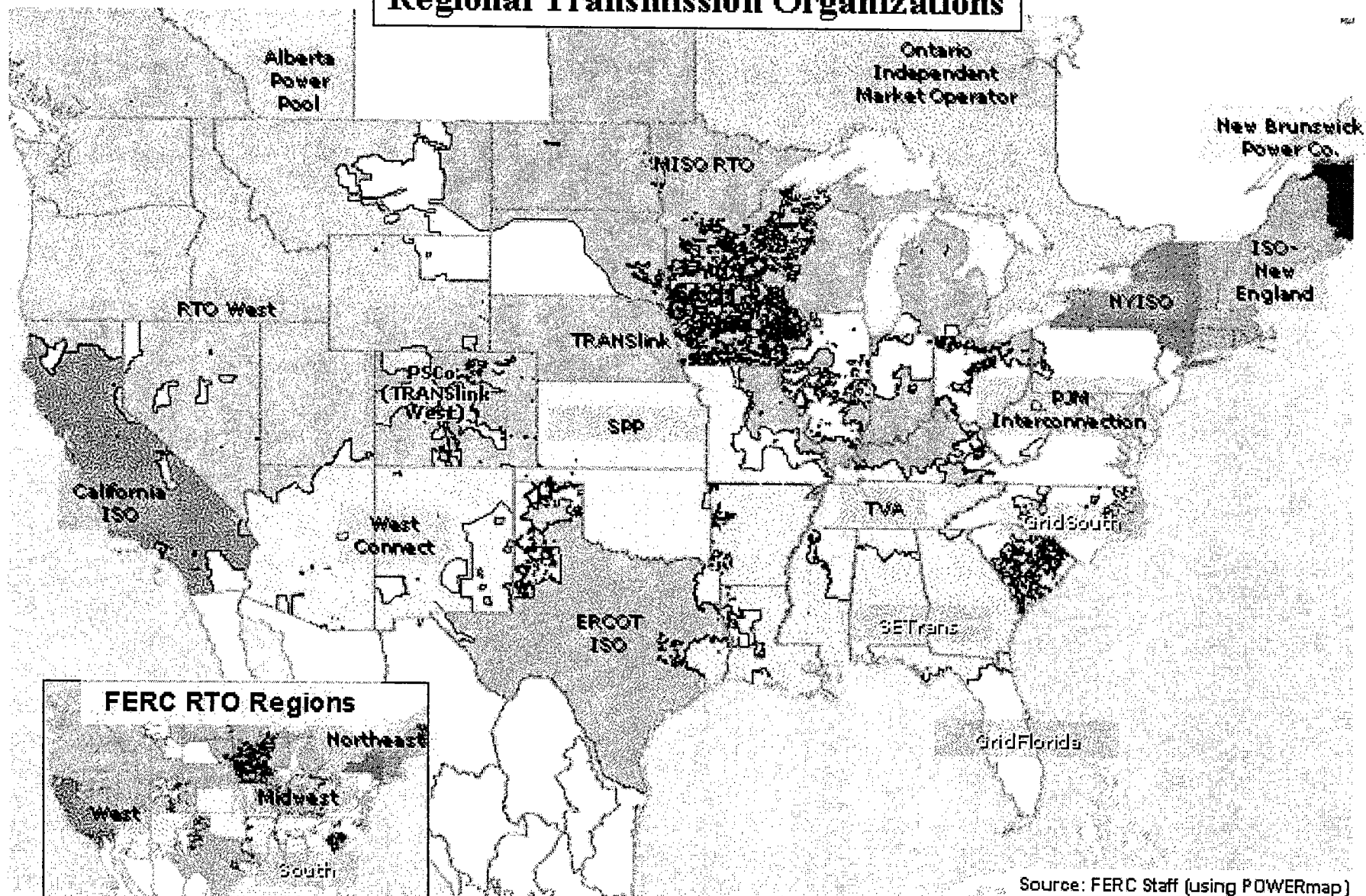
# Historical Synopsis

- ◆ FERC Order 888 also provided for stranded cost recovery
- ◆ FERC Order 889 created OASIS (Open Access Simultaneous Information System) to calculate the Available Transmission Capacity

# Historical Synopsis

- ◆ FERC Order 2000 ordered utilities to “voluntarily” form Regional Transmission Organizations of sufficient scope and configuration, with independent governance, and capable of dealing with seams issues.
- ◆ The RTO was to coordinate generation and transmission on a regional basis & to provide for regional transmission expansion planning
- ◆ PJM Interconnect; NE ISO; NY ISO; California ISO; and others still being formed.

# Regional Transmission Organizations



Source: FERC Staff (using POWERmap)



# Industry Features

- ◆ Electricity is different
- ◆ Kirchhoff's laws - Electricity will flow over all paths from all generators to all loads in inverse proportion to the impedance on the line
- ◆ Electricity is not a typical good or commodity

# Industry Features

- ◆ With some minor exceptions, cannot store electricity
- ◆ Electricity is simultaneously produced and consumed
- ◆ AC must be produced so that generation is synchronized within the grid
- ◆ All electricity produced must be consumed

# Industry Features

- ◆ We have three synchronous electricity grids in the contiguous United States: the Eastern grid, the Western grid, and ERCOT
- ◆ The industry feature of a synchronous grid requires close coordination of generation and transmission

# Industry Features

- ◆ Transmission capacity is constrained by either voltage or thermal limits
- ◆ Typically, you reach thermal limits before voltage limits in the Eastern grid
- ◆ Thermal limits reflect that heat is given off as line losses occur due congestion
- ◆ Transmission lines sag and may flash over grounding them out

# Industry Features

- ◆ The loss of physical plant can be catastrophic
- ◆ Sometimes it is better to isolate plant from the system and to shed load, with the ability to add load later

# Industry Features

- ◆ Components: Generation, Transmission, Distribution
- ◆ With Vertically-Integrated Utilities, Generation, Transmission, and Distribution Are Owned by One Entity That Provides for Coordination
- ◆ Next, Add QFs: Cogeneration and Small Renewable Power Producers

# Industry Features

- ◆ Next, add Independent Power Producers and Exempt Wholesale Generators
- ◆ There begins to be a problem of coordination
- ◆ Also, add power marketers and retail direct access customers
- ◆ There is definitely a problem of communications, cooperation and coordination

# Industry Features

- ◆ Substitute control areas by individual utilities for regional groups with a regional transmission organization to ensure open transmission access and comparable transmission interconnection
- ◆ The RTO is a system operator and controller only
- ◆ The RTO is the security coordinator



# Industry Features

- ◆ An RTO cannot own generation assets
- ◆ FERC perceives electric power generation as A commodity.
- ◆ Electric power generation is not a commodity, because of must-run units, and because power cannot be easily stored, and because sometimes, due to transmission constraints, power might not be deliverable.

# Industry Feature

- ◆ There is still the need to coordinate the RTO and the wholesale market with the regulated load serving entity and the retail market

# Regulatory Authority

## ◆ State Public Service Commissions

- Retail rates: revenue requirement, cost allocation, rate design for each customer class
- Entry
- Quality of service
- Quality of power
- Consumer complaints
- Consumer protection: against anticompetitive behavior and unfair trade practices (false, misleading, or fraudulent) .
- Codes of conduct: affiliate transactions, etc.

# Regulatory Authority

## ◆ State Commissions

- Billing, metering
- Utility disconnection policies
- Protection against undue discrimination
- Approve forecasts (often)
- Approve expansion planning (often)
- Approve integrated resource planning (sometimes)
- Approved certification / certification of need
- Approve issuance of securities / equity / debt
- Approve demand-side management program (sometimes)
- Approve siting (sometimes)

# Regulatory Authority

## ◆ Federal Energy Regulatory Commission

- Statutory, with a chevron deference
- Wholesale rates subject to Sierra-Mobile Doctrine – cannot be easily overturned
- Transmission service
- Open access tariffs
- Wholesale (standard) market design as an extension of EPACT
- Wholesale market monitoring

# Regulatory Authority

## ◆ Federal Energy Regulatory Commission

- No authority over generation facilities
- Claimed authority over ancillary transmission services
- No authority over distribution
- No authority over retail sales to end users

# Regulatory Authority

- ◆ The Environmental Protection Agency, state and federal levels
- ◆ The Security and Exchange Commission over the PUHCA
- ◆ The Nuclear Regulatory Commission over nuclear safety, operation, and decommissioning
- ◆ The Department of Justice, Antitrust Division and the Federal Trade Commission share jurisdiction over competitive wholesale markets (largely for mergers).

# Recent Developments

- ◆ 1996 to the present: may you live in interesting times
- ◆ State commission restructuring to take advantage of low prices on wholesale market: northeast and California first
- ◆ Wholesale price volatility: Midwest; California; Northeast, NY, and PJM
- ◆ Generation plant divestiture without remedying market power problems



# Recent Developments

- ◆ State Reactions: Codes of conduct, strengthening consumer complaints
- ◆ The California debacle
- ◆ The discovery of market manipulation and securities fraud (overstatement of revenues and earnings by Enron and others, via wash sales, etc.; loan collateral abuse)

# Recent Developments

- ◆ The temporary collapse of the power market with overcapacity
- ◆ Utilities on the financial edge
- ◆ Lack of financing for new projects
- ◆ Power shortages around the corner in some regions?