

Fundamentals of Electricity Markets, Economics, & Regulation—Part 1

IPU Power Grid Course 2024

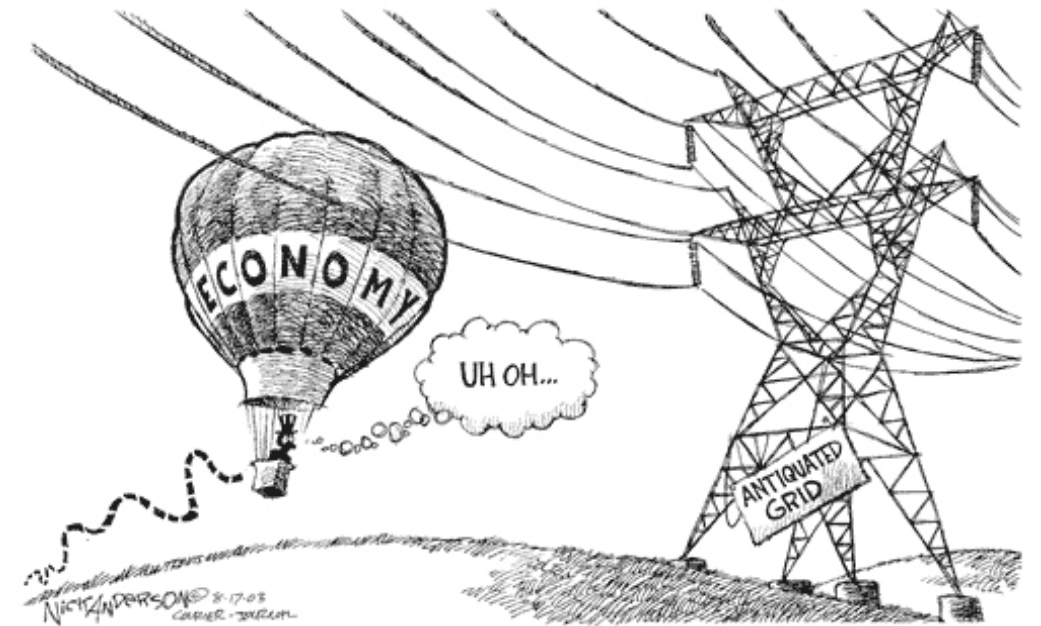
June 11, 2024

Seth Blumsack

Co-Director, Center for Energy Law and Policy

Director, RTO Governance Research Network

Pennsylvania State University





The electric power sector has been going through a process of (almost) non-stop change for over 20 years, after many decades of (more or less) the same model. And more change is on the way!

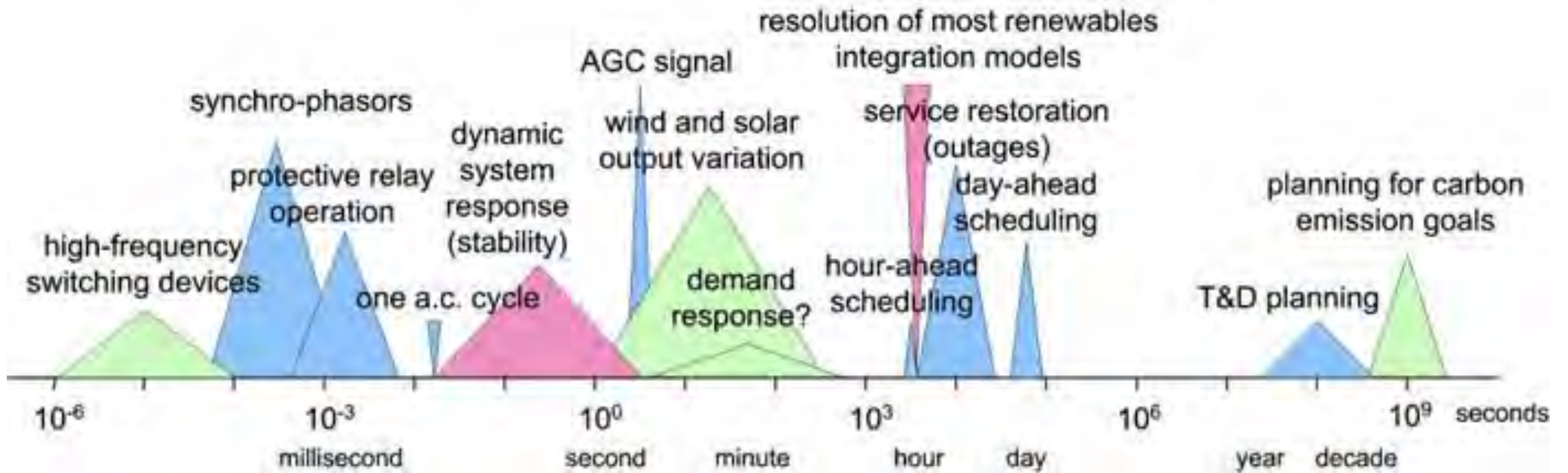


Figure: Alexandria von Meier

- What would you do if you thought that electricity demand would increase next year? Tomorrow? In one hour? Five minutes from now?
- Restructuring has fundamentally changed how we think about these decisions. After 25+ years, we are still not always sure who is charge.

Topics for Today

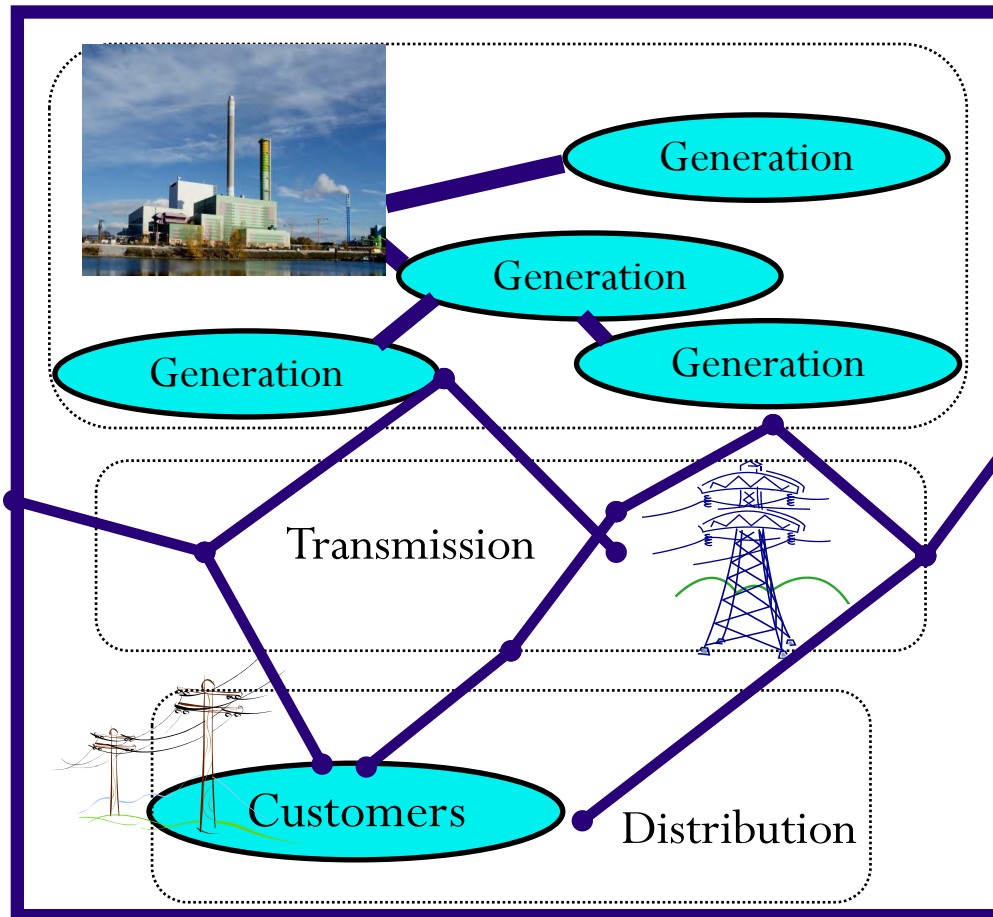
- **Session 1: The many meanings and drivers of electricity “restructuring” or “deregulation”**
- **Session 2: The wild world of markets for power**
- **Session 3: Designing the grid by democracy: planning and governance**

Wholesale market structure, operation, economics, and pricing.

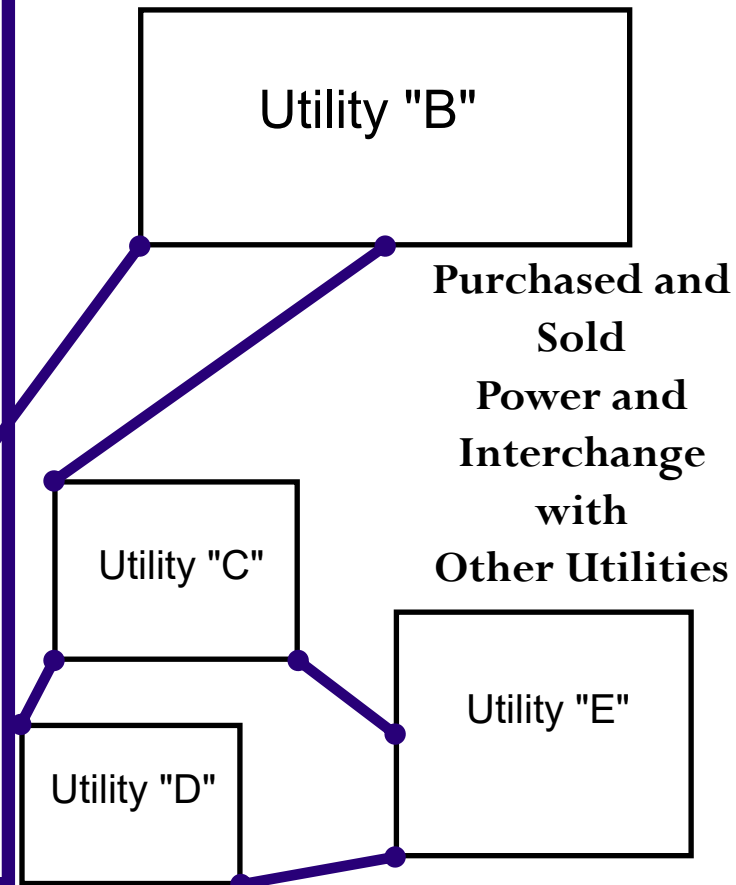
- Wholesale market structure has changed and continues to change considerably since the early to mid-1990s
- Went from price-regulated, vertically-integrated utilities to much of the country having large regional transmission organizations, and some states with retail competition (discussed later)
- However, some states and regions still have regulated vertically integrated utilities
- Almost all states with retail competition are within the footprint of an Independent System Operator or Regional Transmission Operator (or ISO or RTO, defined in a moment), but not all states in an ISO or RTO have retail markets

Electric Utility Industry Structure—Before “Restructuring” of the 1990s

Vertically Integrated Utility "A"



Connected with Other
Vertically Integrated Utilities

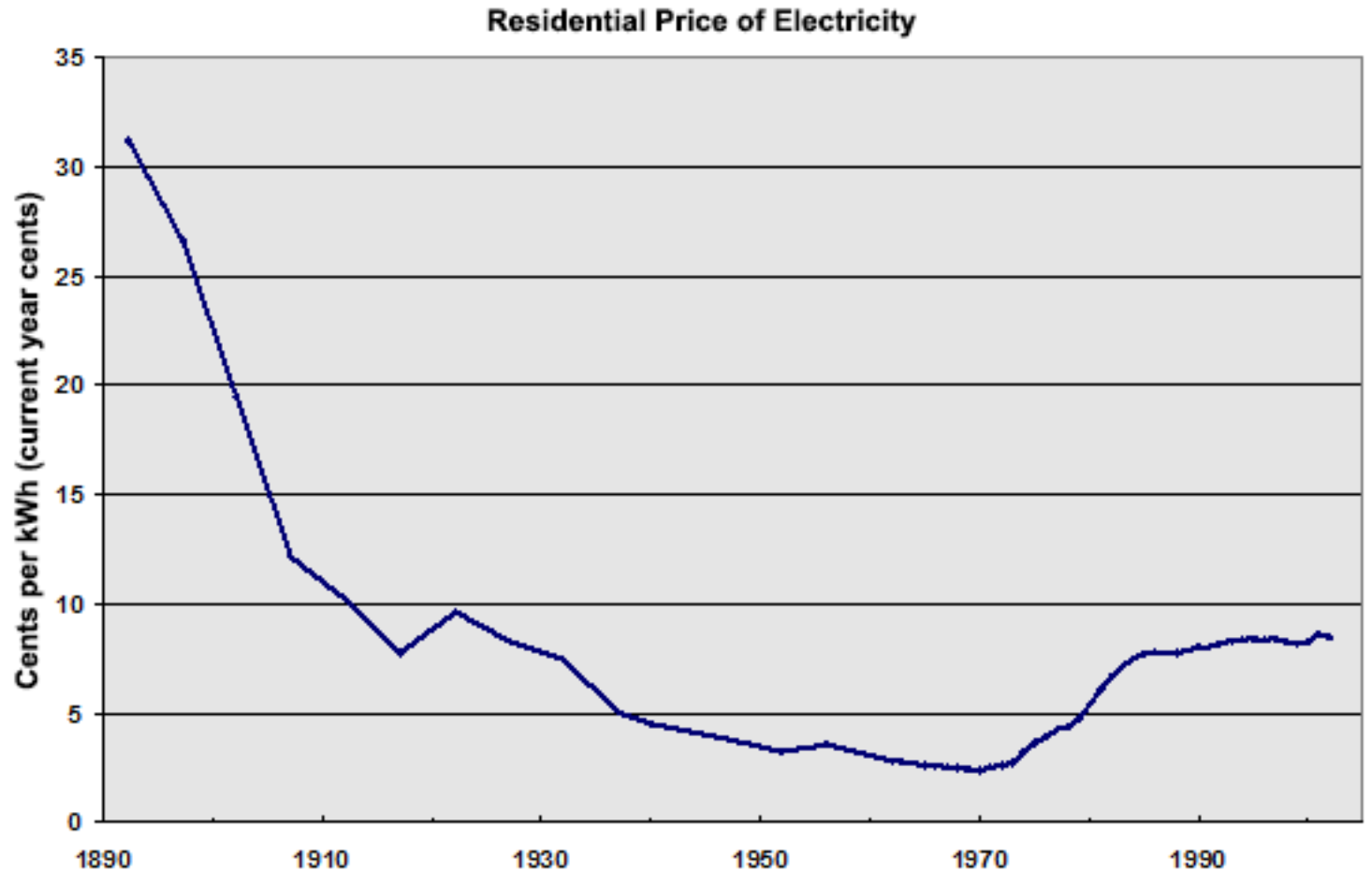


Why Was the Industry Restructured?

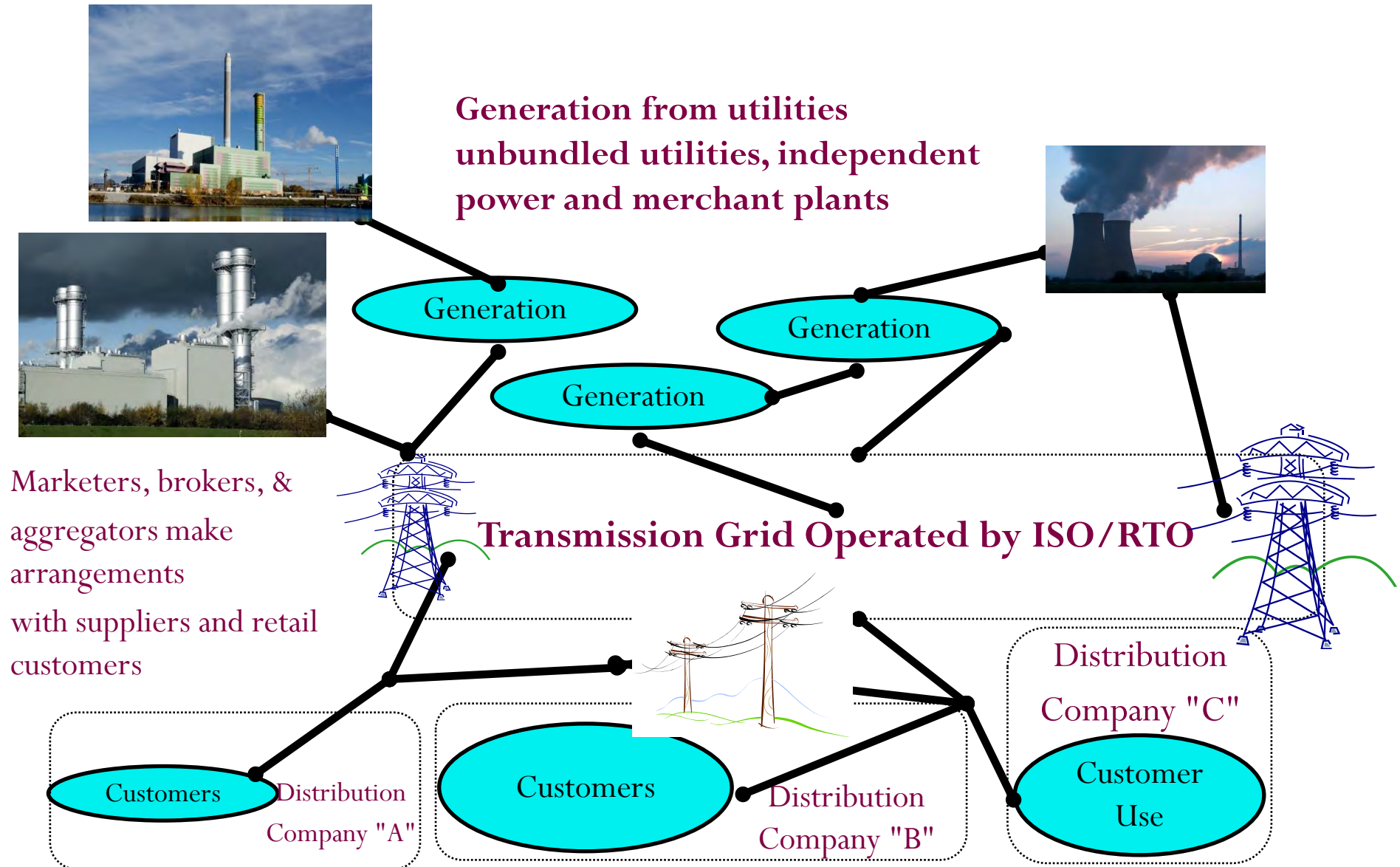
- Industry restructuring occurred because of, in part, the lower price of natural gas (in the late 1980s & 1990s) and the cost of combined cycle turbine generators
- This reduced the optimal size of generation plant
 - allowed independent or merchant generators to enter wholesale markets and challenge incumbent utilities
- Cost overruns and “gold plating” behavior by utilities
- Successful efforts at liberalization in other network industries (natural gas, trucking, airlines)

Why Was the Industry Restructured?

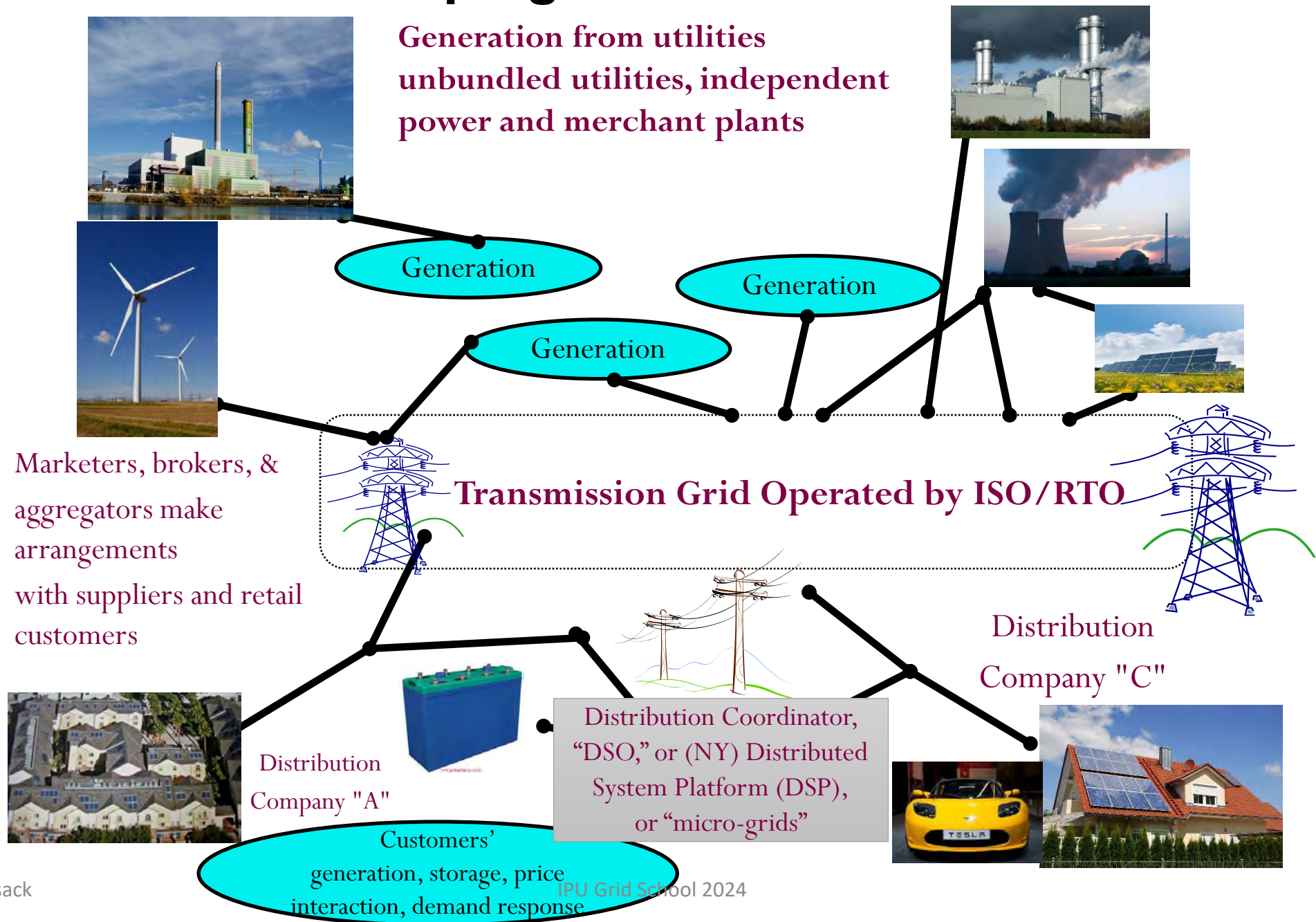
- Adjusted for inflation, the price of electricity in 1892 was \$5.30 per kWh (we pay about 10¢ today)
- The 1970s saw the first ever period of rising electric rates, which concerned large industrial users who feared being disadvantaged in an emerging global economy.



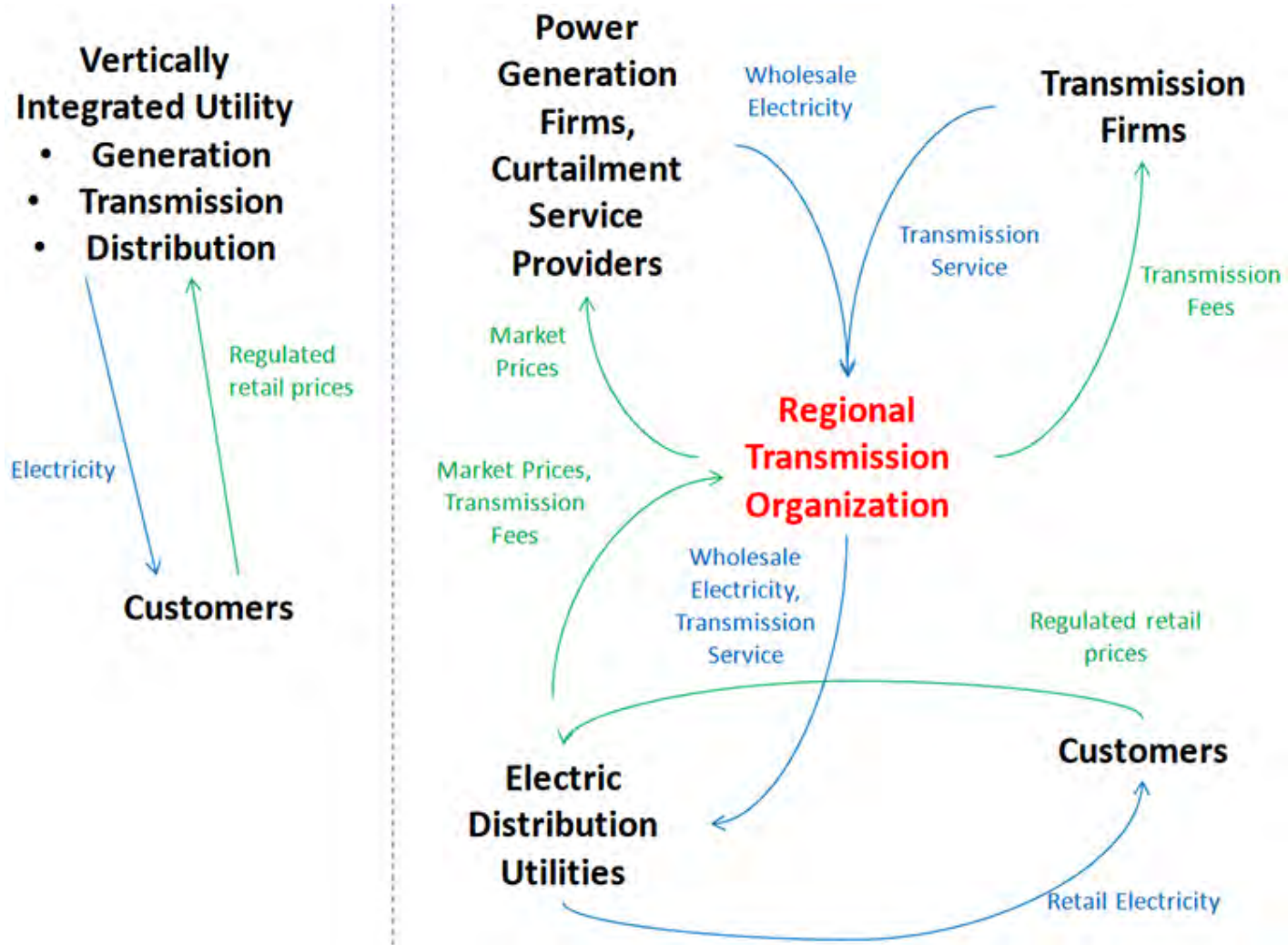
Restructured Electric Supply Industry



Developing Electric Business



Another way to look at the regulated vs restructured industry is how money (green) and electricity (blue) flows



Basic Economics of The Restructured Power Industry

■ Economies of scale

- Occurs when input productivity increases as a firm expands its scale of operations
- Usually means that the average cost per unit of output declines as output (scale) expands
- Scale economies for large generation plants likely ended decades ago; but remain for transmission and distribution
- Scale economies also still important for renewable generation

Basic Economics of Electricity Production and Delivery

(continued)

- Contestable market: One in which the threat of potential competition (low barriers to entry) disciplines incumbent firms, even if they may possess some market power.
 - Scale economies in generation meant more economic competitors
 - The transmission network is the platform on which competition occurs – makes serving demand in a specific location “contestable”
 - For this to work, the regulation of the transmission system needed to change.

Poll #1

Which of the following was NOT a major driver of electricity industry restructuring?

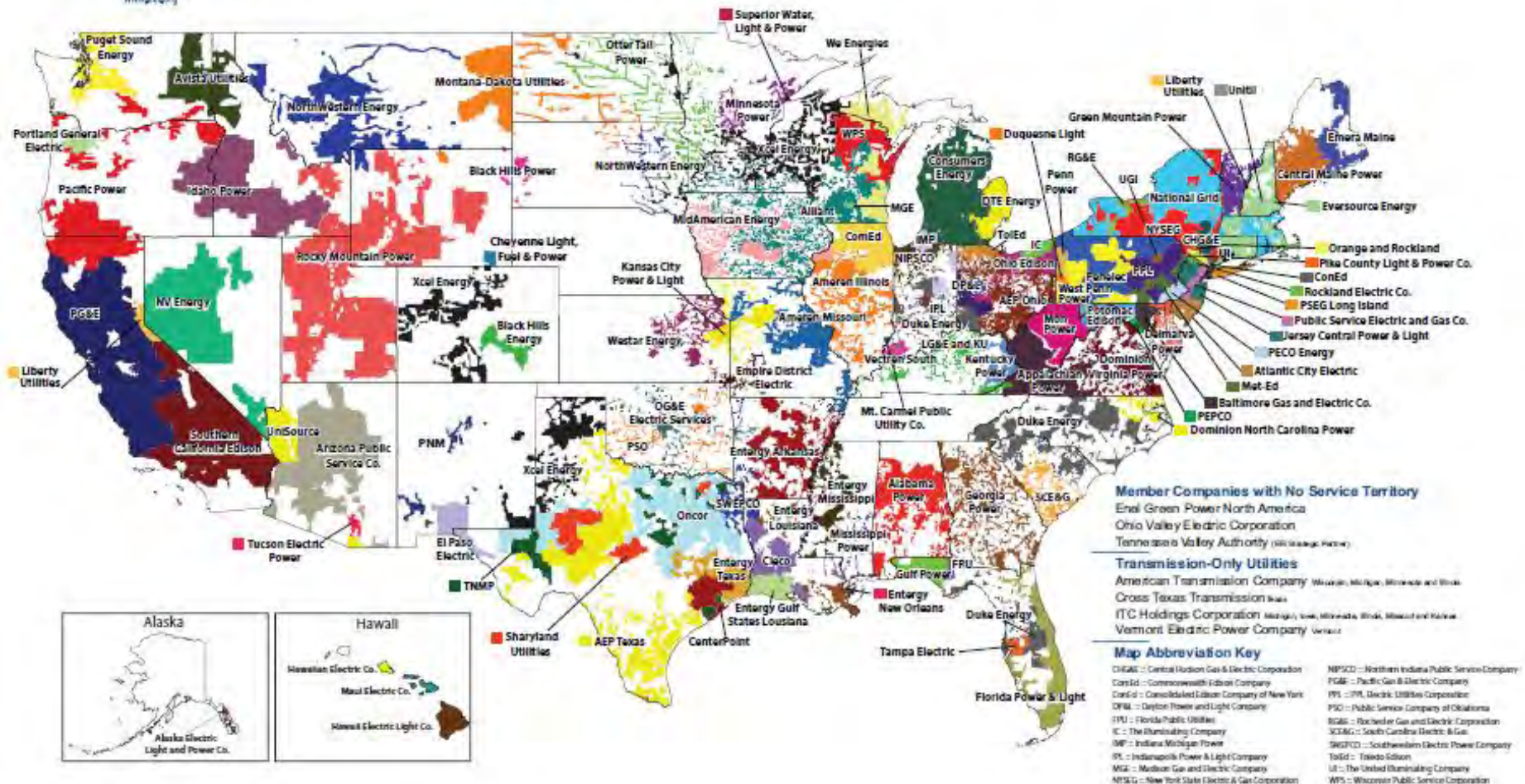
- a) Major breakthroughs in DC power transmission
- b) Rising electricity and fuel costs during the 1970s energy crisis
- c) Economies of scale in power generation
- d) Inefficient behavior by regulated utilities

Role of private, nonprofit, and public power.

Investor-Owned Electric Companies--Approximately 70% of the U.S. electric power industry

EI Edison Electric Institute
 701 Pennsylvania Avenue, N.W.
 Washington, D.C., 20004-2676
www.eei.org

EEI U.S. Member Company Service Territories



Public Power

- Non-profit municipal, state, and locally owned electric utilities
 - over 2,000 public power systems
 - provide over 15 percent of all kWh sales to ultimate customers
 - serve over 47 million people, doing business in every state except Hawaii
 - own approximately 10.3% of the total installed generating capacity in the U.S.
- Non-profit rural electric cooperatives and public power districts
 - more than 900 rural electric cooperatives and public power districts
 - more than 42 million customers in 47 states
 - include consumer-owned local distribution systems and 65 generation and transmission (“G&T”) cooperatives that supply wholesale power to their distribution cooperative owner-members
 - all or portions of 2,500 of the nation’s 3,141 counties are served by rural electric cooperatives
 - cooperative service areas cover 75 percent of the United States landmass
 - cooperatives are incorporated as private entities in states in which they reside

Regulatory jurisdiction and coordination for generation, transmission, and distribution.

Legislation and FERC regulation

Industry Policy Timeline

1978	Public Utility Regulatory Policies Act (PURPA) and rules for qualifying facilities (QFs) Natural Gas Policy Act	
1990	Clean Air Act Amendments	
1992	Energy Policy Act modifies PUHCA and authorizes FERC to require open transmission access FERC Order 636 (gas unbundling)	
1996	FERC Orders 888 & 889 (electricity access); FERC allows recovery of wholesale stranded cost States begin passing electricity restructuring legislation	
1998	Retail access for electricity begins in CA, NH, PA, and RI (initially large-volume customers began earlier)	
1999	FERC Order 2000-A created RTOs and RTO requirements	
2001	FERC allows price caps on California and WSCC wholesale spot market prices	
2005	Energy Policy Act; requires transmission investment incentives; repeals the Public Utility Holding Company Act	
2006	FERC Order 679 provides for transmission investment incentives	
2007	Energy Independence and Security Act	
2009	American Recovery and Reinvestment Act	
2024	FERC Order 1920 (transmission planning and cost allocation)	

Major Federal Actions

- The Clean Air Act of 1970 required new coal plants to use state-of-the-art pollution control equipment -- also raising the cost of generation (amended in 1977 and 1990)
- The natural gas shortage of 1977 & 1978 and other factors led to the enactment of the National Energy Act of 1978, which was comprised of five Acts
- Three of them were relevant for the electric utilities

Federal Actions - *continued*

- The Public Utility Regulatory Policies Act of 1978 (PURPA) provided that certain small renewable resource and cogeneration facilities would be “qualified facilities” (QFs)
- QFs were allowed to sell electricity directly to their host utilities at the host utility's avoided costs
- Interconnection with qualified facilities was required
- More on this later . . .

Federal Actions - *continued*

- The Powerplant and Industrial Fuel Use Act of 1978 prohibited the use of natural gas and oil for new electric generation
- The Natural Gas Policy Act of 1978 and the Natural Gas Wellhead Decontrol Act of 1989 provided for phased-in deregulation of wellhead gas prices
- The provisions of the Fuel Use Act that prohibited gas-fired generation were repealed in 1987
- The Energy Policy Act of 1992 (EPAAct) introduced exempt wholesale generators (EWGs) into the market
- EWGs are wholesale generators exempt from the PUHCA

FERC Implementation of 1992 EPA Act

- The Energy Policy Act of 1992 required open transmission access to facilitate broader wholesale markets
- FERC Order 888 (1996) required all regulated utilities (as well as those unregulated ones wanting reciprocity) to provide *open access* and *comparable* transmission interconnection and service to generation units not owned by the regulated utilities
- Participation in an independent transmission organizations was voluntary

FERC Order 2000

- FERC Order 2000 "Regional Transmission Organizations" Issued December 20, 1999
- Order 2000's "minimum characteristics and functions that an RTO must satisfy"
 - 1) Independence
 - 2) Scope and Regional Configuration
 - 3) Operational Authority
 - 4) Short-term Reliability

FERC Order 2000 (*continued*)

- Minimum Functions:
 1. Tariff Administration and Design
 2. Congestion Management
 3. Parallel Path Flow
 4. Ancillary Services
 5. OASIS--Open Access Same-Time Information System, and Total Transmission Capability and Available Transmission Capability
 6. Market Monitoring
 7. Planning and Expansion
 8. Interregional Coordination

Energy Policy Act of 2005

(TITLE XII – ELECTRICITY)

- Sec. 1211. Electric Reliability Standards
 - Was a response to the 2003 blackout
 - creates rules for mandatory standards and a new reliability organization
 - July 2006, FERC certified NERC as the Electric Reliability Organization (ERO)
 - NERC develops and enforces mandatory electric reliability standards under FERC's oversight

Energy Policy Act of 2005 (continued)

- Sec. 1253. PURPA QF Purchase and Sale Requirements
 - modifies Section 210 of PURPA to prospectively repeal mandatory purchase obligation in certain competitive situations and removes QF ownership limitations
- Subtitle F – Repeal of PUHCA
- Subtitle G – Market Transparency, Enforcement, and Consumer Protection

Order No. 1920 -- Transmission Planning and Cost Allocation (May 13, 2024 – more on this later)

- Several primary objectives:
 1. Requires long-term AND regional transmission planning (which some RTOs and non-RTO utilities had not done very well)
 2. Several reforms to planning “local” transmission upgrades
 3. Improved integration of generation and transmission interconnection
 4. Requires incorporation of various alternatives to traditional transmission builds (e.g. transmission switching, dynamic line ratings)
- In addition, Order 1920 outlines a seven-criteria benefits test for evaluation of transmission plans and projects.

Major Orders & Regulations



Legal

Overview

Federal Statutes

Major Orders & Regulations

Policy Statements

Standards of Conduct for
Transmission Providers

Open Access Same-Time
Information System

Off-the-Record
Communications

Administrative Litigation

Alternative Dispute Resolution

Court Cases

Complaints

Settlements

The Commission's regulations are found under [Title 18 Chapter I of the Code of Federal Regulations \(CFR\)](#). If you would like to conduct your own search of the CFR you can access the [Governmental Printing Organization/National Archives and Records Administration](#) website. A comprehensive listing of the Commission's rulemaking proceedings can be found at www.regulations.gov.

The **Landmark** tab contains certain landmark orders that set precedent in establishing the regulations on how FERC will regulate a certain area that we have jurisdiction over. General contains certain major orders that have an effect on all the industries that FERC regulates.

Landmark	General	Electric	Gas	Hydropower	Oil	18 CFR
Order No.	Date	Title				
AD21-15-000	June 17, 2021	Order Establishing Task Force and Soliciting Nominations				
RM20-15-001/Order No. 871-B	May 4, 2021	Order modifying its June 2020 rule prohibiting construction of an approved natural gas project until the Commission acts on requests for rehearing.				
IN19-4-000	March 18, 2021	Order to Show Cause and Staff Report regarding Rover Pipeline, LLC and Energy Transfer News Release				
Order No. 872-A (RM19-15-001)	November 19, 2020	Order Addressing Arguments Raised on Rehearing, and Clarifying Prior Order No. 872, in Part (PURPA). (Final Rule)				

Source: <https://www.ferc.gov/major-orders-regulations>

Order No.	Year	Title
636	1992	Restructuring of Interstate Natural Gas Pipeline Services
888	1996	Transmission Open Access. Promoting Wholesale Competition Through Open Access Non-discriminatory Transmission Services by Public Utilities; Recovery of Stranded Costs by Public Utilities and Transmitting Utilities
889	1996	OASIS: Open Access Same-Time Information System and Standards of Conduct
637	1999	Regulation of Short-term Natural Gas Transportation Services, and Regulation of Interstate Natural Gas Transportation Services
2000	1999	Establishment of Regional Transmission Organizations proposals
2003	2003	Standardization of Generator Interconnection Agreements and Procedures
2004	2003	Standards of Conduct (see Standards of Conduct for Transmission Providers section for more detail)
2006	2005	Standardization of Small Generator Interconnection Agreements and Procedures
890	2007	Preventing Undue Discrimination and Preference in Transmission Service
697	2007	Market-Based Rates for Wholesale Sales of Electric Energy, Capacity and Ancillary Services by Public Utilities
719	2008	Wholesale Competition in Regions with Organized Electric Markets
741	2010	Credit Reforms in Organized Wholesale Electric Markets
745	2011	Demand Response Compensation in Organized Wholesale Energy Markets
1000	2011	Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities
831	2016	Offer Caps in Markets Operated by Regional Transmission Organizations and Independent System Operators
841	2018	Electric Storage Participation in Markets Operated by RTOs and ISOs
844	2018	Uplift Cost Allocation and Transparency in Markets Operated by RTOs and ISOs
845	2018	Reform of Generator Interconnection Procedures and Agreements
872	2020	Certain revisions to the Commission's regulations implementing sections 201 and 210 of the Public Utility Regulatory Policies Act of 1978 (PURPA).
2222	2020	Participation of Distributed Energy Resource Aggregations in Markets Operated by RTOs and ISOs
RM21-17-000	2022	Building for the Future Through Electric Regional Transmission Planning and Cost Allocation and Generator Interconnection
RM22-10-000	2022	Transmission System Planning Performance Requirements for Extreme Weather
RM22-14-000	2022	Improvements to Generator Interconnection Procedures and Agreements

Poll #2

Which of the following major pieces of legislation or FERC Orders do you deal with most often in your job? (Note: there is no right or wrong answer)

- a) Clean Air Act or amendments (environmental compliance)
- b) PURPA (utility purchases/sales with qualifying facilities)
- c) Sec. 1211 of the 2005 Energy Policy Act (reliability standards and compliance)
- d) FERC Order 2000 (Regional Transmission Organizations)
- e) FERC Order 1000 or 1920 (Transmission Planning)
- f) Another piece of legislation or FERC Order
- g) Federal legislation and FERC Orders don't impact my job very much.

The Special Role of PURPA

The Public Utility Regulatory Policies Act of 1978 (PURPA)

- PURPA was passed as part of a package of legislation known as the National Energy Act that was intended to address the on-going “energy crisis” of the time
- Among other goals, PURPA was intended to encourage conservation, reliability, and efficiency in the delivery and generation of electricity, and do so with “equitable retail rates for electric consumers”
- The primary concerns at the time was the increasing amounts of imported oil and the national security risks that imposes
- Also of concern was the security in supply of natural gas
- Conservation by electric utilities of oil and natural gas was important since petroleum-based liquids accounted for over 16 percent and natural gas was almost 14 percent of the fuel used to generate electricity (on a total kilowatthour basis) in 1978

PURPA, QFs, and Avoided Cost

- Under the Public Utility Regulatory Policies Act of 1978 (PURPA), qualifying facilities, that is cogeneration facilities or small power production facilities, had a right to be served by, and sell to their host electric utilities at the **utility's** avoided cost
- *Cogeneration facilities* are those which produce electric energy and steam or forms of useful energy (such as heat) which are used for industrial, commercial, or cooling purposes (aka, CHP)
 - no maximum size limitation for PURPA qualification
 - EAct 2005 prohibits PURPA machines, emphasizing that useful energy must be produced
- *Small power production facilities* are facilities which use biomass, waste, or renewable resources including wind, solar energy and water, to produce electric power; which, together with other facilities at the same site, have a capacity equal to or less than 80 MW

The Original PURPA “Must Purchase” Obligation

- The Must Purchase Obligation applies to all electric utilities, including IOUs, municipals, rural cooperatives, PUDs, water districts, the TVA, and each federal power marketing authority, unless FERC grants a waiver
- FERC requires that host utilities must purchase at rates equal to **the host utility’s full avoided cost**: “the incremental cost to the electric utility of electric energy or capacity or both which, BUT FOR the purchase from the QF or QFs, such utility would generate itself or purchase from another source” (CFR sec. 292.101(b)(6))

The Original PURPA “Must Sell” Obligation

- Each host electric utility is required to sell to any QF any energy and capacity requested by the QF
- The host electric utility is required to provide such electric service to a QF at rates that are just and reasonable, in the public interest, and which do not discriminate against cogenerators and small power producers

EPAAct 2005 Changes the “Must Purchase” Obligation

- EPAAct 2005 provided a new section (210(m)) that requires FERC to excuse host utilities from entering into new purchase or contract obligations *if* there is access to a sufficiently competitive market for a QF to sell its power
- Specifically, there is no utility must purchase obligation if FERC finds that the QF has nondiscriminatory access to:
 - (1) independently administered, auction-based day ahead and real time wholesale markets and wholesale markets for long-term sales of capacity and energy (e.g., MISO, PJM, ISO-NE, NYISO), or
 - (2) an RTO with competitive wholesale markets, or
 - (3) wholesale markets that are comparable to (1) or (2).

EPAAct 2005 Changes the “Must Purchase” Obligation

- FERC by rulemaking in Order 688 determined that MISO, PJM, ISO-NE, and the NY-ISO provide wholesale markets which meet the statutory criteria for member utilities to qualify for relief from the mandatory “must purchase” obligation
- FERC did not terminate the must purchase obligation
 - electric utilities must file applications for relief and QFs in the above markets may, under the rule, rebut the presumption of access because of operational characteristics or transmission constraints

EPAAct 2005 Changes the “Must Sell” Obligation

- Under EPAAct’s PURPA amendments, the mandatory obligation to sell can be terminated if FERC finds that competing retail electric suppliers are willing and able to sell and deliver electric energy to the QF; AND the electric utility is not required by State law to sell electric energy in its service territory
- For example, consider that in most (but not all) of the MISO footprint, the obligation to sell might persist even though there would be no obligation to purchase
- ***Unaffected*** – the rights or remedies of any party under contract or obligation, in effect or pending approval of the State PSC or non-regulated utility at the time of EPAAct 2005’s enactment, to purchase from or sell electric energy or capacity to a QF

FERC PURPA Changes in Order No. 872 (2020)

FERC granted states avoided cost rate-setting flexibility to

1. require *energy rates* (not capacity rates) in QF power sales contracts to *vary in accordance with changes in the purchasing electric utility's avoided costs at the time the energy is delivered*
 - a QF would no longer be able to elect to have fixed energy rate, but would be entitled to a fixed capacity rate for the term of the contract
2. granted states flexibility to allow QFs to have a fixed energy rate based on projected energy prices during the term of a QF's contract based on the anticipated dates of delivery
3. established a rebuttable presumption that the locational marginal price (LMP) established in the organized electric markets represents the avoided costs of energy for electric utilities located in these markets.
 - for QFs selling to electric utilities located outside of the organized electric markets states permitted to set energy avoided cost rates at competitive prices from liquid market hubs or calculated from a formula based on natural gas price indices and specified heat rates
4. provided states the flexibility to set energy and capacity rates pursuant to a competitive solicitation process conducted under transparent and non-discriminatory procedures

FERC PURPA Changes (*continued*)

- FERC modified its “one-mile rule” for determining whether SPP facilities are the same site for determining qualification
- allow electric utilities, state regulatory authorities, and other interested parties to show that affiliated SPP facilities that use the same energy resource that are:
 - distances one mile or less apart are irrebuttably the same site,
 - more than one mile apart and less than 10 miles apart are (rebuttably) at the same site, and
 - distances 10 miles or more apart are irrebuttably at separate sites
- allow challenges to initial self-certification or self-recertification without being required to file a separate petition for declaratory order and to pay the associated filing fee

FERC PURPA Changes (*continued*)

- Revised FERC's section 210(m) PURPA regulations that provide for the termination of an electric utility's *obligation to purchase* from a QF with nondiscriminatory access to certain wholesale markets by:
 - Lowering the rebuttable presumption that SPP facilities (but not cogeneration facilities) have nondiscriminatory access from 20 MW to 5 MW and
 - revised PURPA regulations to provide a nonexclusive list of examples of factors that QFs may cite to support an argument that they lack nondiscriminatory access to such markets
- FERC clarified that a QF must demonstrate commercial viability and a financial commitment to construct its facility pursuant to objective and reasonable state-determined criteria before the QF is entitled to a contract