

Introduction to Market Reform Options for South Carolina

PRESENTED BY
Brattle Team

PRESENTED FOR
South Carolina Market
Reform Study Committee

MARCH 23, 2022



Agenda

1

Discuss Status Quo in South Carolina

2

Begin Review of Market Reform Options

Agenda

1

Discuss Status Quo in South Carolina

- South Carolina Rates and Reliability
- Key System Functions in the Status Quo

2

Begin Review of Market Reform Options

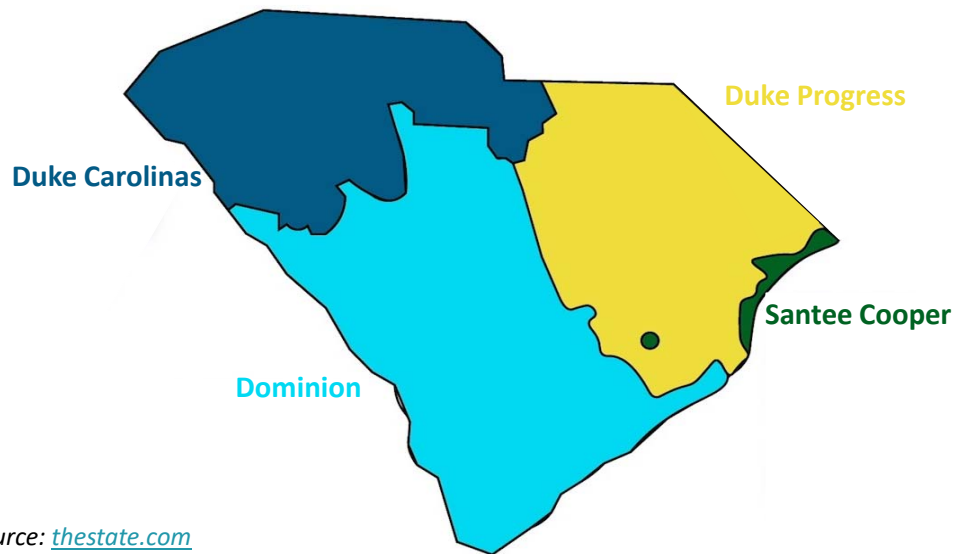
SOUTH CAROLINA STATUS QUO

SC is Served By the Vertically Integrated Utilities and Cooperatives

Vertically integrated utilities are the prevalent model in SC; cooperatives buy from Santee Cooper and own some of their own generation

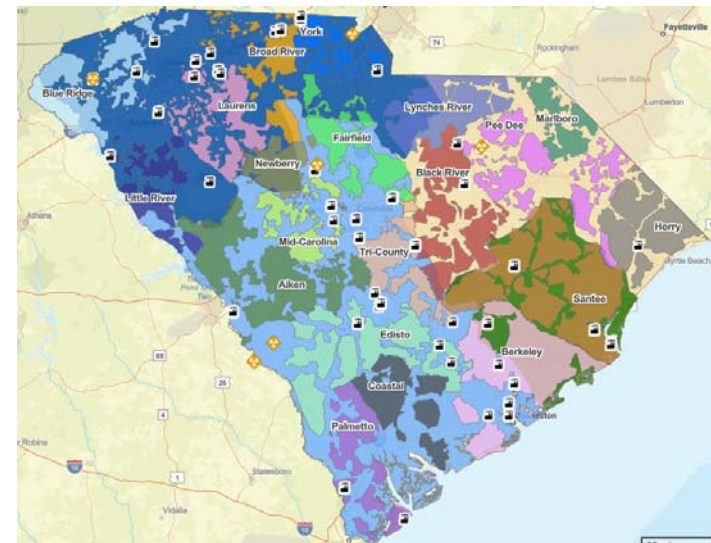
- The rest of the Southeast, and many other parts of the country, are also served by the vertically integrated model

SC Vertically Integrated Utilities



Source: thestate.com

SC Electric Cooperatives



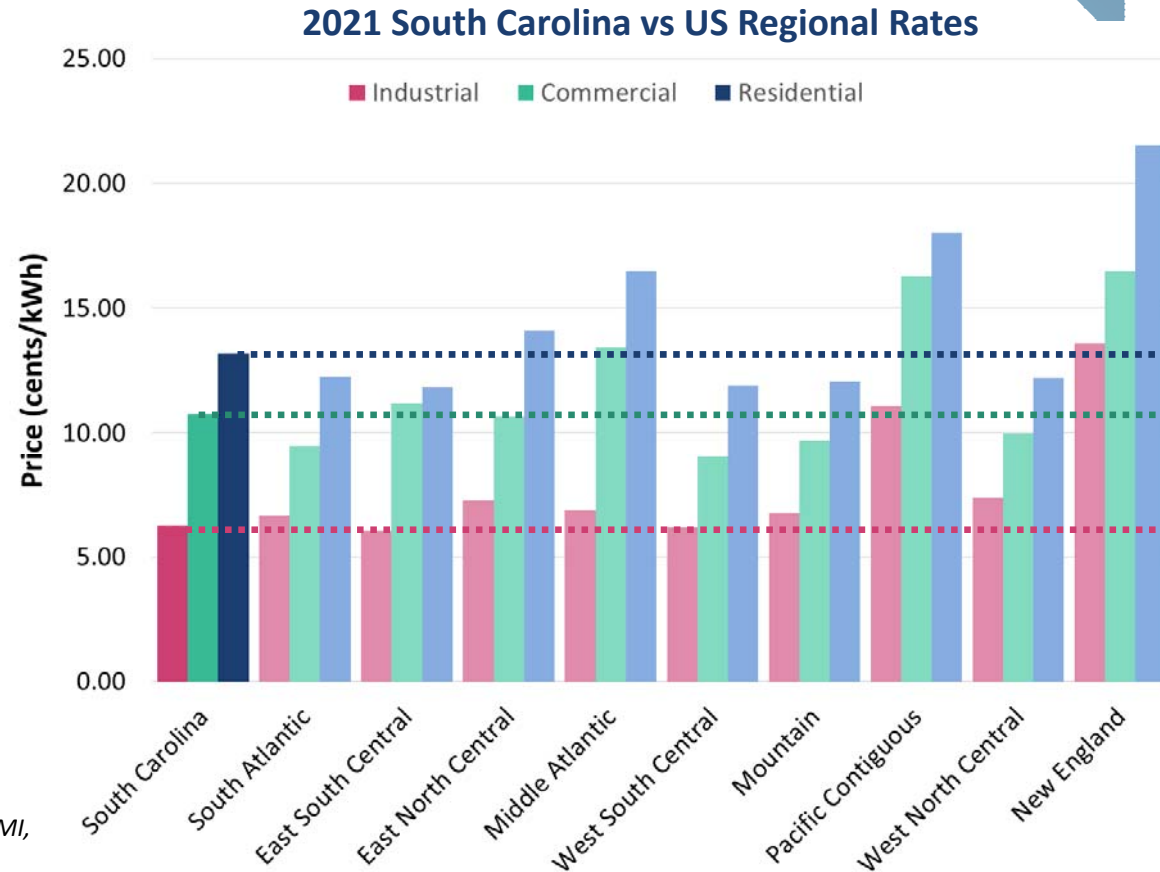
Source: energy.sc.gov

How do Electric Rates in SC Compare to other States?



Comparing retail rates across regions may not be an apples-to-apples comparison

- Regions with abundant hydro, low-cost renewables or fuels, tend to have lower rates, as do regions with lower cost of building infrastructure (e.g., land, permitting, etc.)
- These factors tend to drive rates more than market structures
- South Carolina most comparable with the neighboring states in the South Atlantic region (see next slide)



South Atlantic: DE, DC, FL, GA, MD, NC, SC, VA, WV
East South Central: AL, KY, MS, TN
East North Central: IL, IN, MI, OH, WI
Middle Atlantic: NJ, NY, PA
West South Central: AR, LA, OK, TX
Mountain: AZ, CO, ID, MT, NV, NM, UT, WY

Pacific Contiguous: CA, OR, WA
West North Central: IA, KS, MN, MO, NE, ND, SD
New England: CT, ME, MA, NH, RI, VT
Not shown: AK, HI

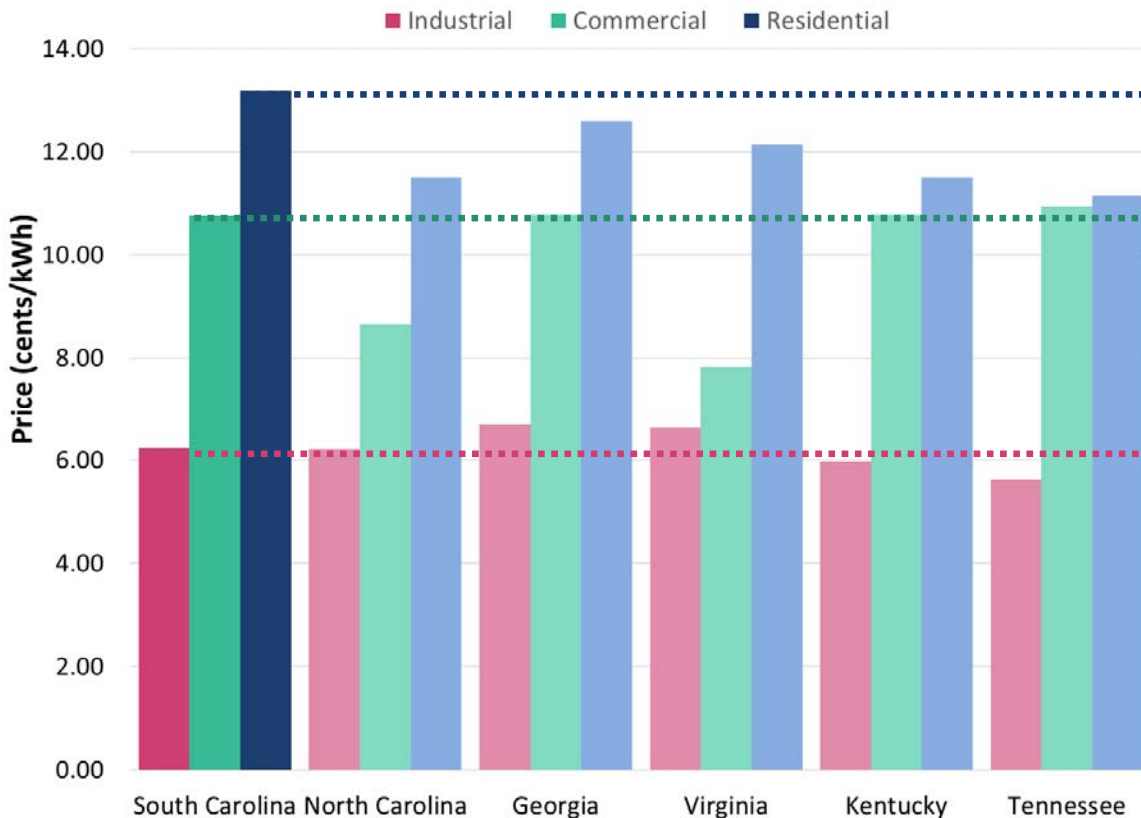
Source: [U.S. Energy Information Administration](https://www.eia.gov)

SOUTH CAROLINA STATUS QUO

How do Electric Rates in SC Compare to other States?



2021 South Carolina Rates vs Neighboring States



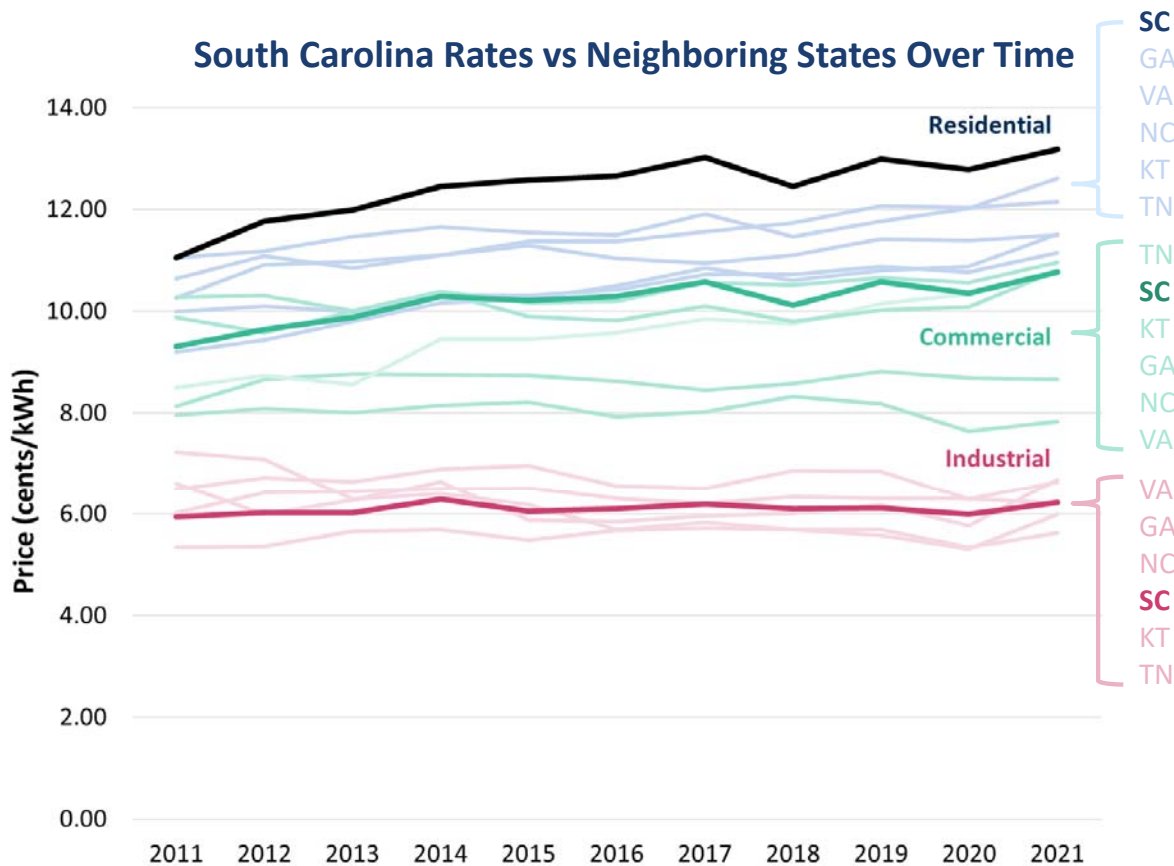
Source: [U.S. Energy Information Administration](https://www.eia.gov)

Industrial customers in South Carolina pay rates that are in-line with neighboring states

- **Residential** customers in South Carolina pay more than similar customers in neighboring states
- **Commercial** customers in South Carolina pay more than in NC or VA but are similar to the rest of the region
- The figure shows average rates across the state, customers of each utility/cooperative in the state pay different rates

SOUTH CAROLINA STATUS QUO

South Carolina Electricity Rates



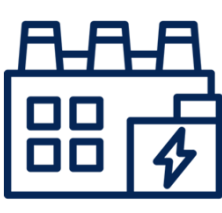
Source: [U.S. Energy Information Administration](#)

Note: State ranking is based on most recent 2021 rates.

Residential and Commercial customers in South Carolina have seen rates increase by ~20% in the last ten years


- **SC Residential** rates have been consistently higher than neighboring states over the past 10 years
- **SC Commercial** rates toward higher end of region, NC and VA have been notably lower
- **SC Industrial** customers however have seen rates remain stable over the same time and are in line with neighboring states

What drives reliability issues on the system today?



Generation: long-term planning to ensure enough generation resources to meet future peak demand and short-term operational decisions to balance availability of supply and demand

Transmission: dependable delivery of electricity from power plants to load centers. Long-term planning aims to build the system to be robust during outages (“contingencies”) under high-load stress conditions



Distribution: supply from bulk power system to end users. Long-term planning ensures system accommodates load growth, with regular maintenance/management to control outages

<5% of outage minutes:
NERC sets standards

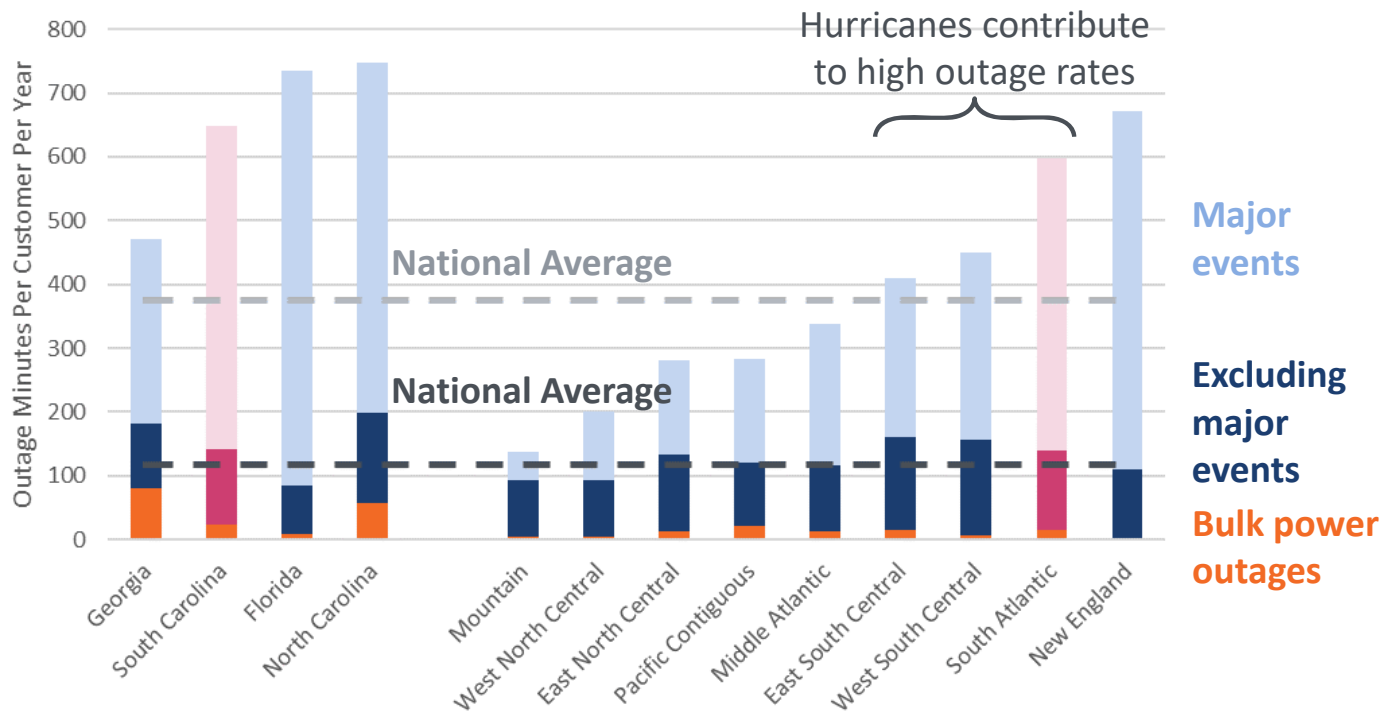
>95% of outage minutes:
States set standards

SOUTH CAROLINA STATUS QUO

South Carolina Reliability



2016-2020 Average Outage Minutes per Customer per Year



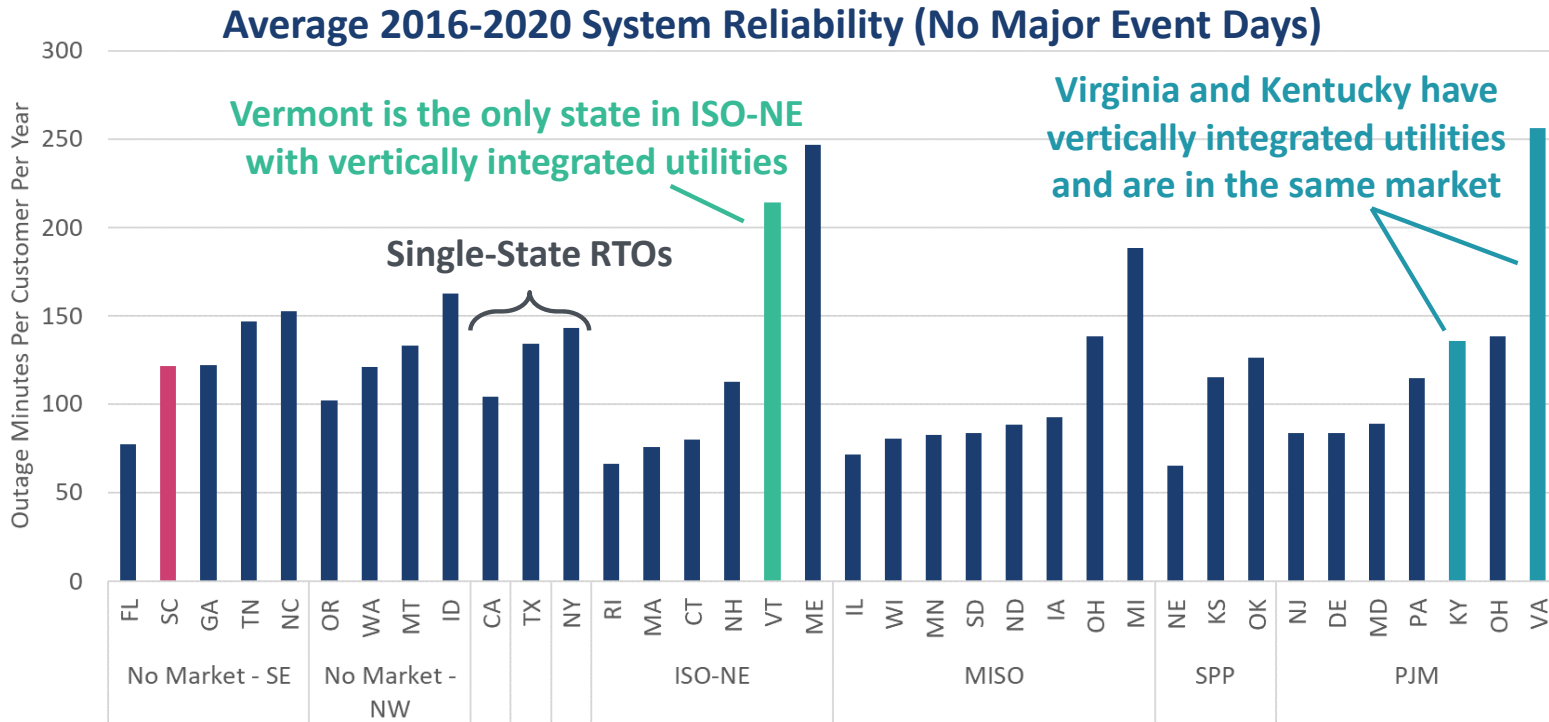
Most outages are due to major storms, which tend to be higher in the South Atlantic Region

- Reliability metrics are reported both with and without major events
- Distribution system outages by far the largest factor
- The bulk power system (generation and transmission) drive few outage minutes

Source: [U.S. Energy Information Administration](https://www.eia.gov)

Reliability in Market Regions vs. Non-Market Regions

Reliability metrics vary among regions with and without markets, and even among states within the same market.



Source: [U.S. Energy Information Administration](https://www.eia.gov)

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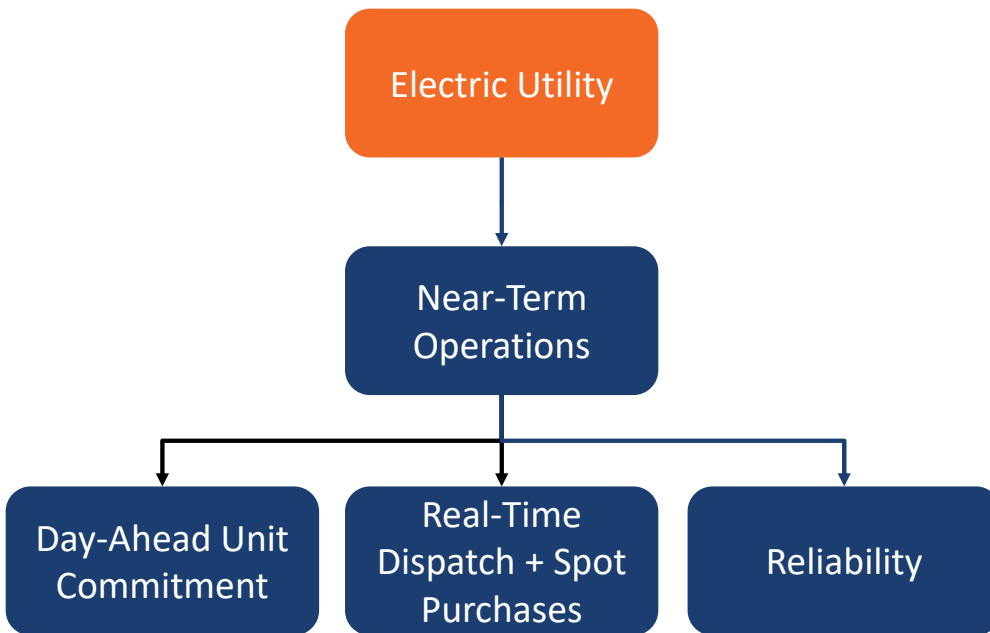
Key Functions, Responsibilities, and Players

Although utilities are the main parties responsible for wholesale and retail functions in SC, regulators, lawmakers, unregulated companies, and non-governmental agencies oversee and influence outcomes:

- **Utilities:** own and operate regulated generation, transmission, and distribution (with regulated cost recovery), conduct near-term operations and long-term generation and transmission planning, administer generation interconnection, charge FERC-regulated transmission rates for inter-utility trading, purchase or sell wholesale power bilaterally with neighboring utilities, perform distribution system planning and operation, serve retail customers
- **Independent Power Producers (IPPs):** own and operate unregulated generation (no regulated cost recovery), need to apply to interconnect to the transmission system through utility-administered process.
- **Qualifying Facilities (QFs):** small-scale generation resources owned by IPPs that qualify under PURPA for state-regulated rates based on avoided costs, and must be included by utilities in their resource mix
- **South Carolina Government:** establishes energy policy for the state, including incentives for certain types of generation assets
- **SC Public Service Commission (PSC):** approves long-term planning efforts (Integrated Resource Plans), approves return on investment for investor-owned utilities (IOUs), regulates investments in the distribution system, establishes retail rates charged to customers
- **Federal Government:** establishes federal energy policy (e.g., tax credits for renewables, PURPA, emissions regulations)
- **Federal Energy Regulatory Commission (FERC):** mandates open access transmission, regulates transmission rates for inter-utility (and any unbundled) usage of the grid
- **North American Electric Reliability Council (NERC):** sets reliability criteria that govern near-term operations and long-term planning of generation and transmission to ensure that utilities maintain an adequate and reliable system

Wholesale Functions: Near-Term Operations

In the Status Quo, the utilities are responsible for conducting day-to-day system operations to ensure customers are served

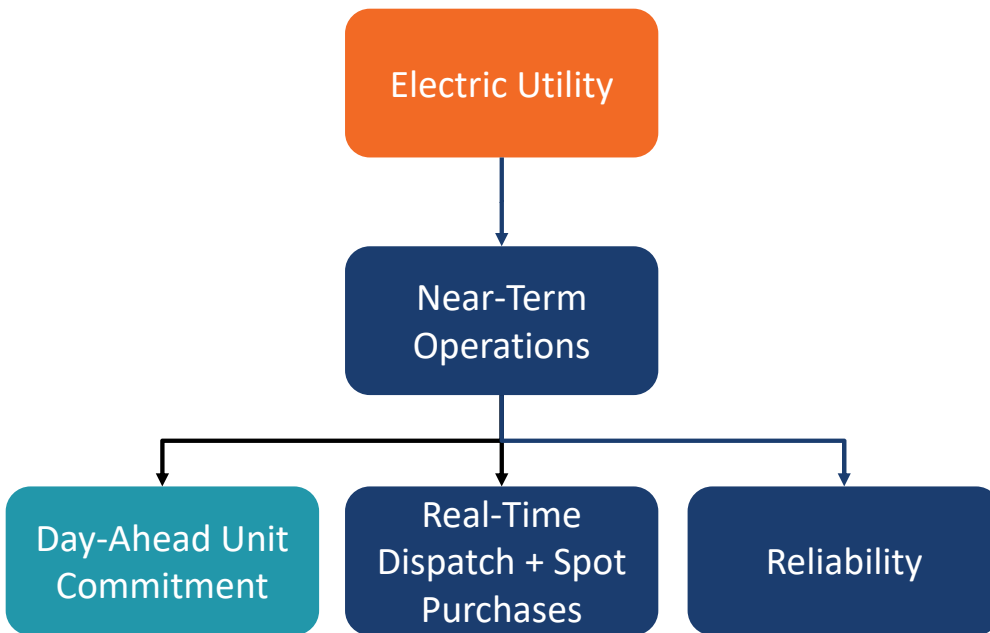


Near-term operations include:

- Forecasting demand for power starting days in advance up to minutes prior to real-time
- Forecasting generation from renewable resources days in advance up to minutes prior to real-time
- Scheduling the operation of generation resources and usage of transmission facilities days in advance
- Purchasing or selling power to neighboring utilities (bilateral transactions) when necessary to serve load, or when profitable

Wholesale Functions: Near-Term Operations (cont'd)

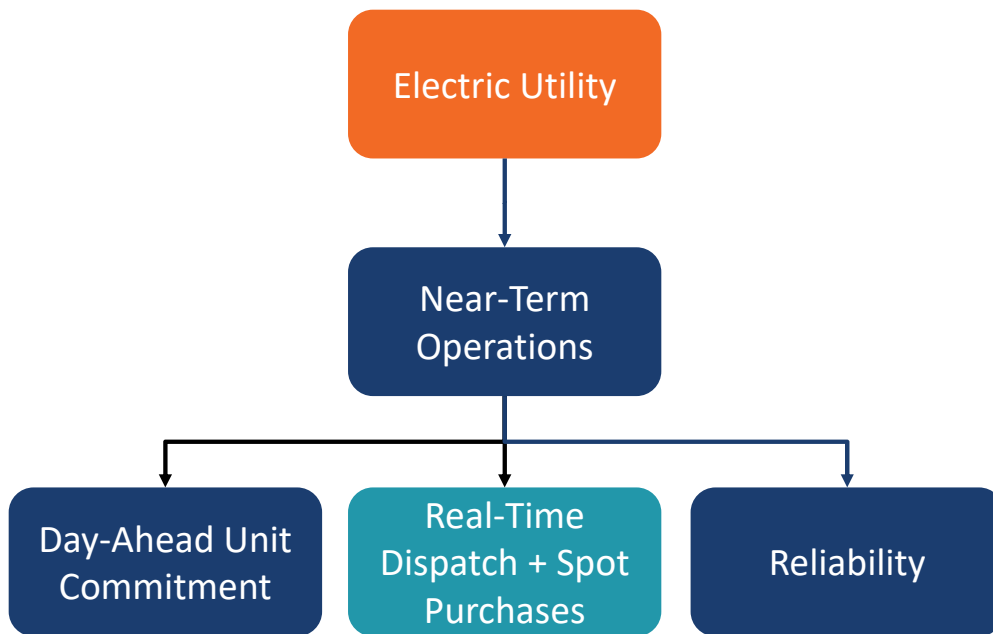
Utilities schedule generation resources to operate based on expected demand in the following day



- Day-ahead (or earlier) scheduling is essential for generation resources that require a long time to start up or shut down (e.g., nuclear, coal)
- Utilities maintain day-ahead (and earlier) forecasts of demand for electricity and renewable production
- Long-lead time resources are scheduled in advance based on their relative economics; shorter-lead time resources can be schedule closer to real-time
- The usage of transmission facilities are scheduled day-ahead, indicating the transmission capacity available for bilateral spot transactions
- Utilities ensure enough resources are committed to provide operational reserves in-line with NERC criteria

Wholesale Functions: Near-Term Operations (cont'd)

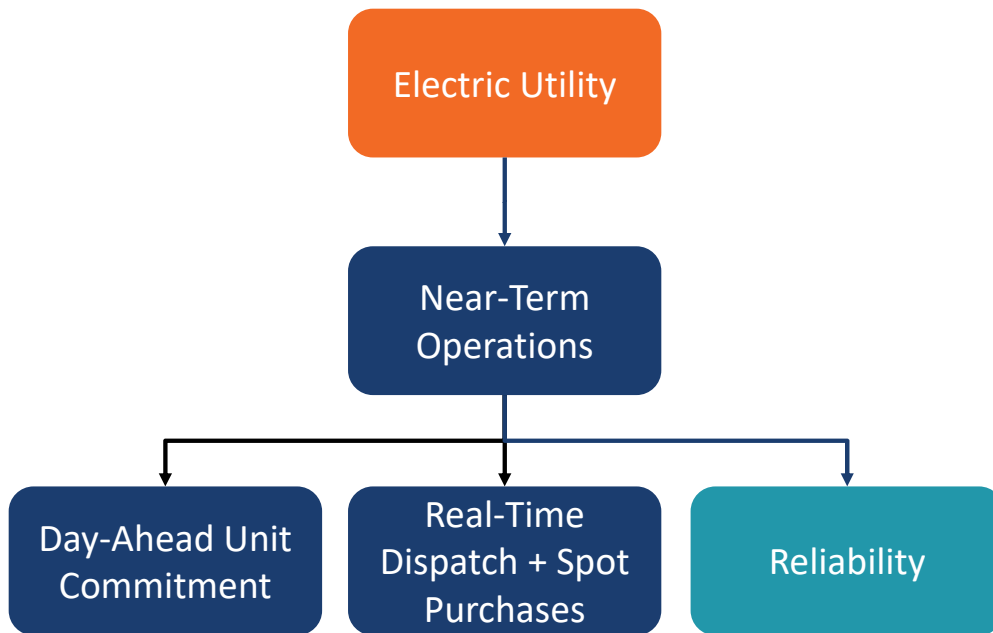
Minutes to an hour ahead of real-time, generation resources receive final dispatch instructions based on updated demand forecasts



- Utilities make last-minutes adjustments to the production levels of generation resources to account for unexpected deviations in demand and variable generation resources
- Fast-response resources (e.g., gas peakers, battery storage, hydro) can be deployed within minutes to balance supply and demand
- Bilateral purchases and sale from neighboring utilities can be executed (on a 15-min to hourly basis) to help balance the system, but are generally limited due to transmission fees, lack of a transparent market price, coordination inefficiencies, and lack of profit motivate for regulated utilities (e.g., utilities enjoy regulated cost recovery for fuel and power purchases)

Wholesale Functions: Near-Term Operations (cont'd)

System balancing with owned/contracted resources or spot purchases occurs close to real-time to ensure reliable service

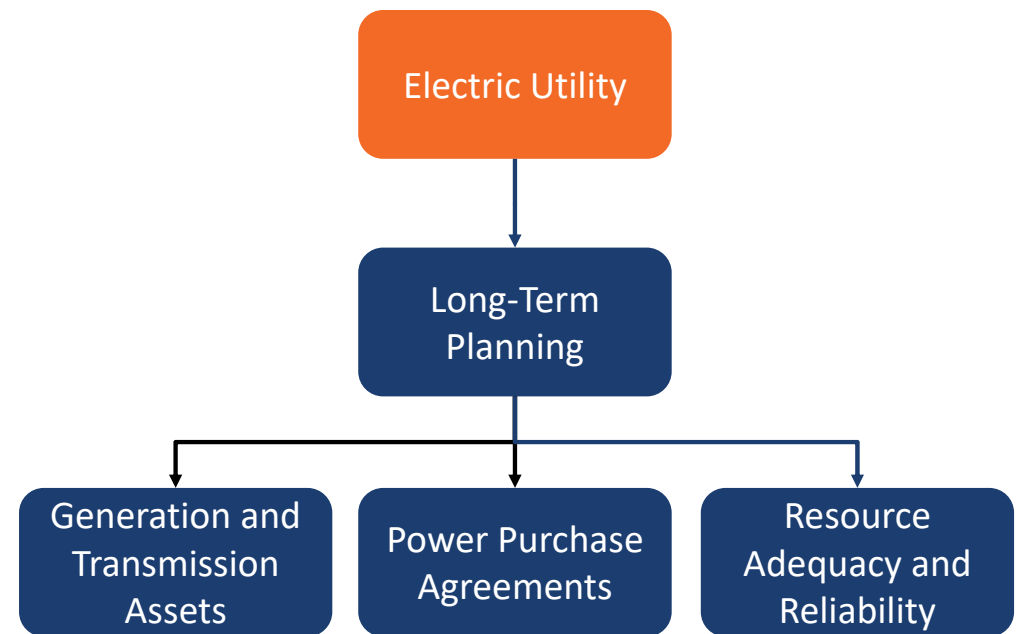


- Operational reliability is the responsibility of the Balancing Authority (BA); in South Carolina Duke, Dominion, and Santee Cooper are the BAs
- NERC requirements ensure BAs also schedule and dispatch resources to supply **operating reserves** (e.g., generation capacity in excess of expected demand)
- Reserves must come from qualified resources that can respond to dispatch instructions within a specific timeframe (e.g., 10-minutes, 30-minutes, etc)
- If necessary, operating reserves are deployed to make up any shortfalls in available generation
- BAs can attempt to buy from neighboring utilities and rely on “demand response” customers when operating reserves are not adequate

Wholesale Functions: Long-Term Planning

Utilities develop Integrated Resource Plans (IRPs) to determine needed generation and transmission plans to identify grid investments

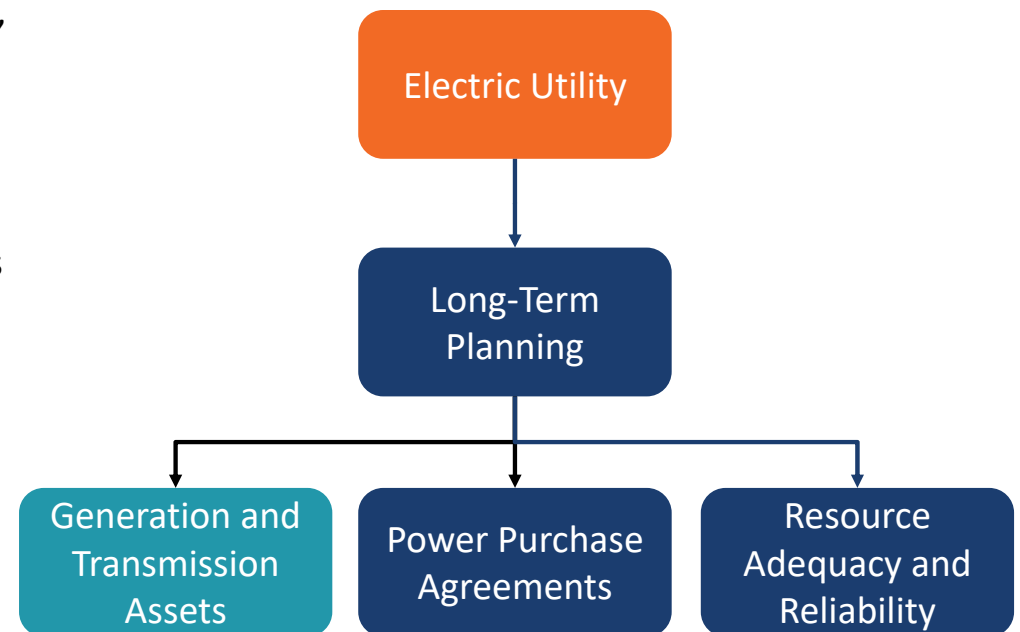
- Utilities forecast demand years into the future, plan for asset retirement, account for state/federal policies, forecast investment and operational costs for different resource types, and other assumptions about future system conditions
- The IRPs analyze different portfolios and select a generation resource investment plan
- Duke and Dominion's IRPs are approved by the PSC, Santee Cooper and cooperative plans are approved by their boards (Santee Cooper also files its plan with the SC Legislature)
- After approval, utilities recover costs (and approved ROI for IOUs) from customers



Wholesale Functions: Long-Term Planning (cont'd)

Utilities plan both generation and transmission assets to keep up with demand growth and comply with federal and state policies

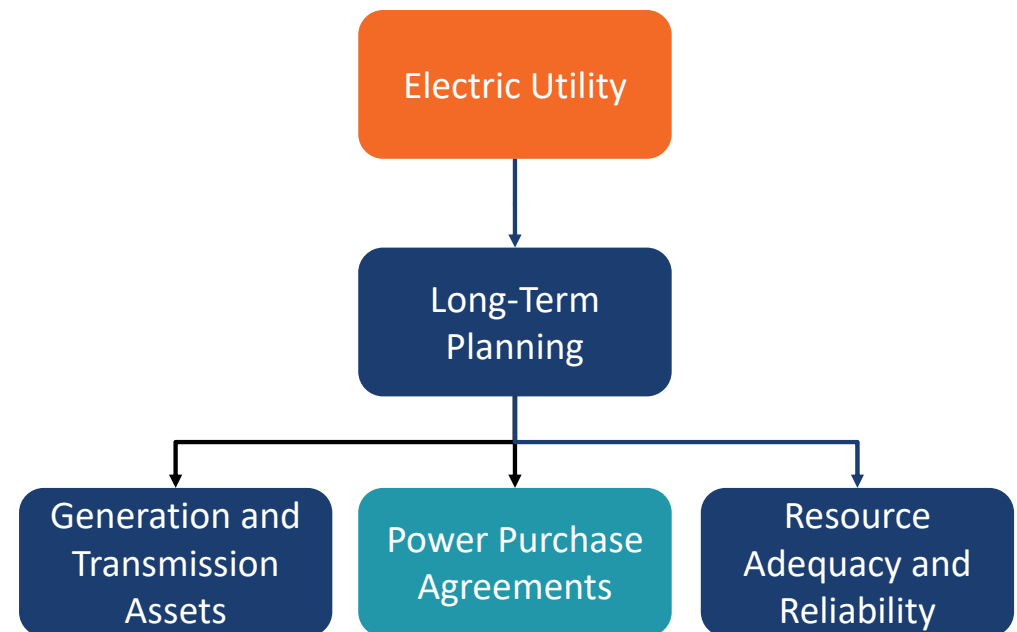
- Utilities' IRPs analyze future costs of building, owning, and operating different asset types and select the portfolio that best meet future needs; transmission is planned to make sure the system remains reliable
- IOUs (Duke, Dominion) tend to prefer to build and own assets because they earn returns on investments
- State and federal policies can drive investment decisions; some examples
 - Federal tax credits have lowered the cost of renewables
 - North Carolina clean energy policies drive Duke resource planning decisions
- Once approved, customers pay for the investments regardless of how costs change in the future



Wholesale Functions: Long-Term Planning (cont'd)

Power purchase agreements (PPA) with IPPs may be selected if they lower the cost of supplying customers relative to building new assets

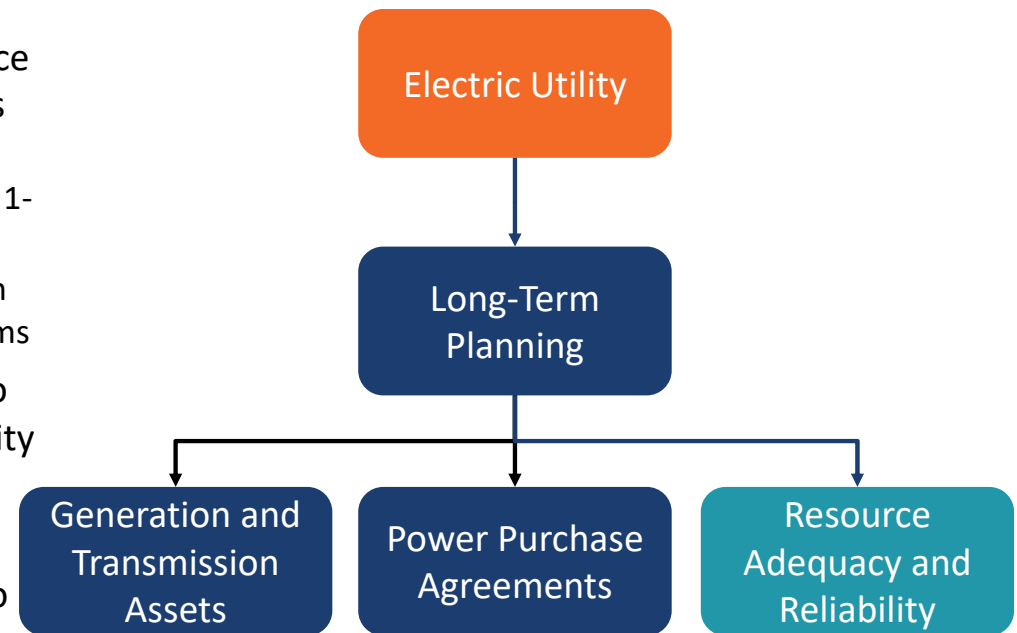
- The IRP processes will also consider signing long-term PPAs with IPPs if that is a lower-cost option than self-build and ownership
- In addition to PPAs, federal law (PURPA) requires utilities to integrate qualifying facilities (today these are usually small-scale solar facilities) as part of their plans and pay them state-regulated rate based on “avoided cost”
- FERC regulation requires that IPPs have open access to use the transmission system (at FERC-regulated rates), which also requires utilities to administer a generation interconnection process to allow IPP-owned resources to connect to the grid



Wholesale Functions: Long-Term Planning (cont'd)

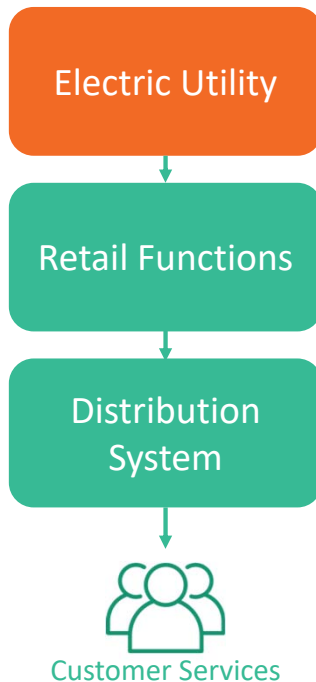
Utilities plan for extra generation capacity and build in system redundancies to ensure adequate supply and a reliable grid

- NERC criteria govern long-term planning to ensure adequate generation and reliable transmission is in place to accommodate future demand and system conditions
 - NERC criteria do not aim to eliminate all outages, which would be very costly, but limit frequency of outages (e.g., a 1-event-in-10-year standard for generation)
 - NERC criteria govern generation adequacy and transmission reliability (the “bulk power system”), not distribution systems
- Generation: NERC requires utilities to have resources to meet a **planning reserve margin** (e.g., additional capacity to serve unexpectedly high demand)
 - Reserve margins vary by utility, but typically are 15-20%
- Transmission: NERC requires utilities to build the grid to withstand outages under high-demand conditions



Retail Functions: Distribution System and Customer Services

In states without retail choice (such as South Carolina), customers are required to take service from the utility with the local franchise

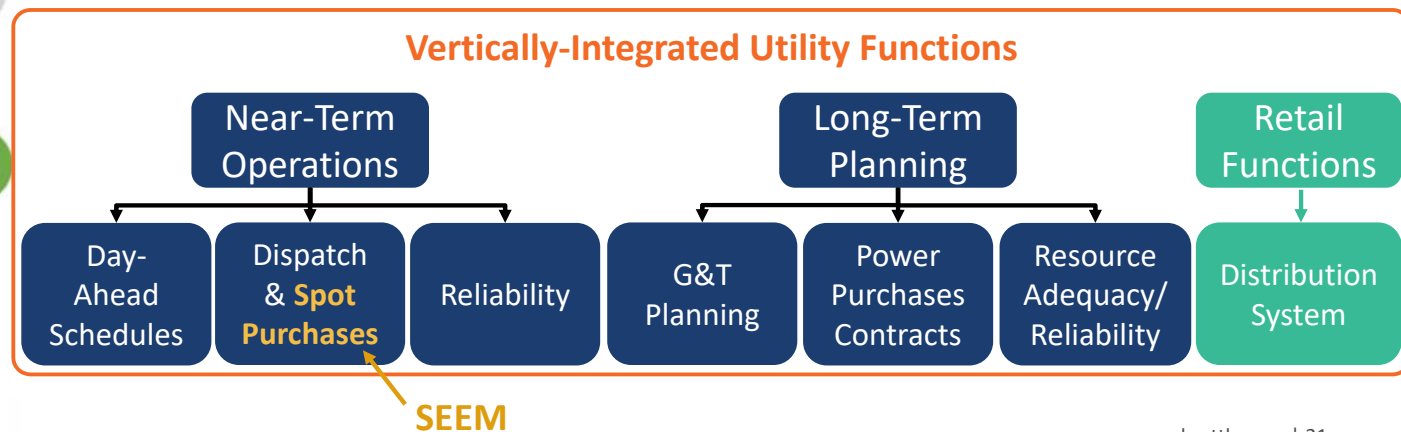
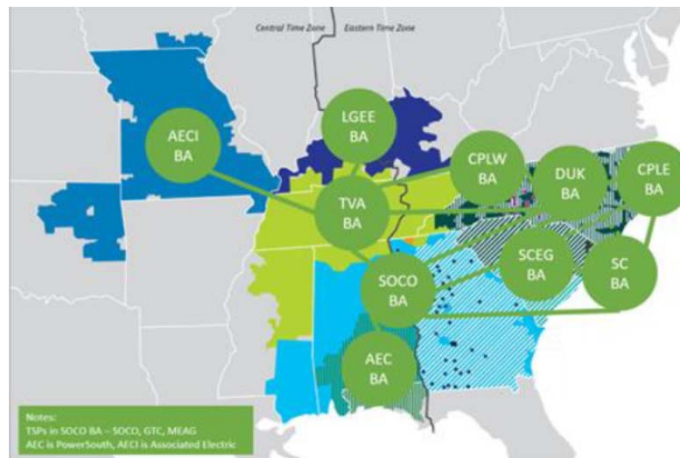


- Retail functions include owning, operating, and maintaining the distribution system; utilities plan for distribution system investments
- The IOUs in South Carolina (Duke and Dominion) directly serve customers in their territories (no retail choice)
- Santee Cooper serves some customers directly, but also supplies electric cooperatives and municipal utilities with wholesale services, who then serve retail customers
- Central Electric Cooperative is a customer of Santee Cooper, and supplies its member cooperatives with wholesale services; the member cooperatives directly serve customers
- The SC PSC approves distribution system capital investments and operation plans, and sets retail rates for IOUs to include distribution and retail service costs (bundled with generation and transmission costs)

The Southeast Energy Exchange Market (SEEM)

The SEEM will facilitate bilateral spot trades between utilities on spare transmission after day-ahead & intra-day trades are completed

- The SEEM will create a bilateral spot trading platform that helps (1) match buyers and sellers of power and (2) find unused transmission capability to execute transactions
- The SEEM will not change which entities are responsible for the different functions discussed (the utilities in SC)
- SEEM does not rely on “nodal” markets used by ISO/RTO and Energy Imbalance Markets (EIM) and is not open to non-utility market participants



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MARKET REFORM OPTIONS

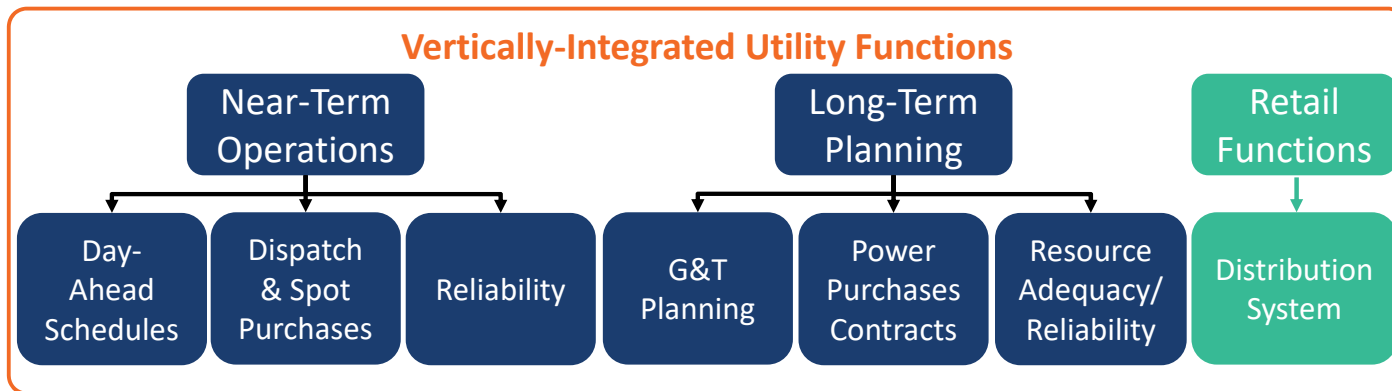
Impact of Market Reform Options

The market reform options listed in Act 187 have the potential to change how the various functions are provided to customers, including:

- Which entities are responsible for providing the described functions
- What drives operational and investment decisions
- Who bears the risks of fluctuating market prices and inefficient operational and investment decisions

The market reform options will not change:

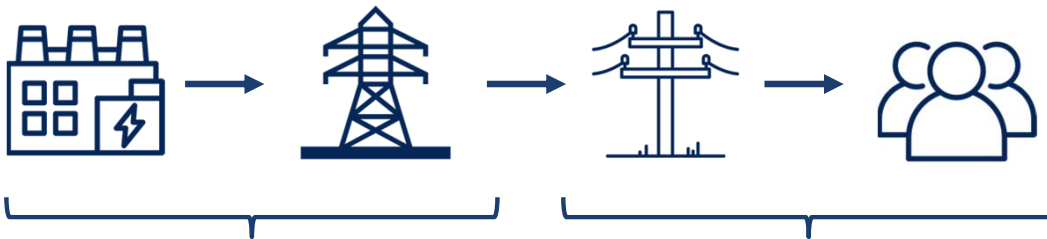
- The ability of the state government to (a) set state energy policy, (b) implement retail choice (or not) and (c) decide industry structure (e.g., whether to retain vertically-integrated utilities)
- The ability of the PSC to establish retail rates (*retail choice would reduce the PSC's scope of setting rates*)



MARKET REFORM OPTIONS

Wholesale vs. Retail Market Reform

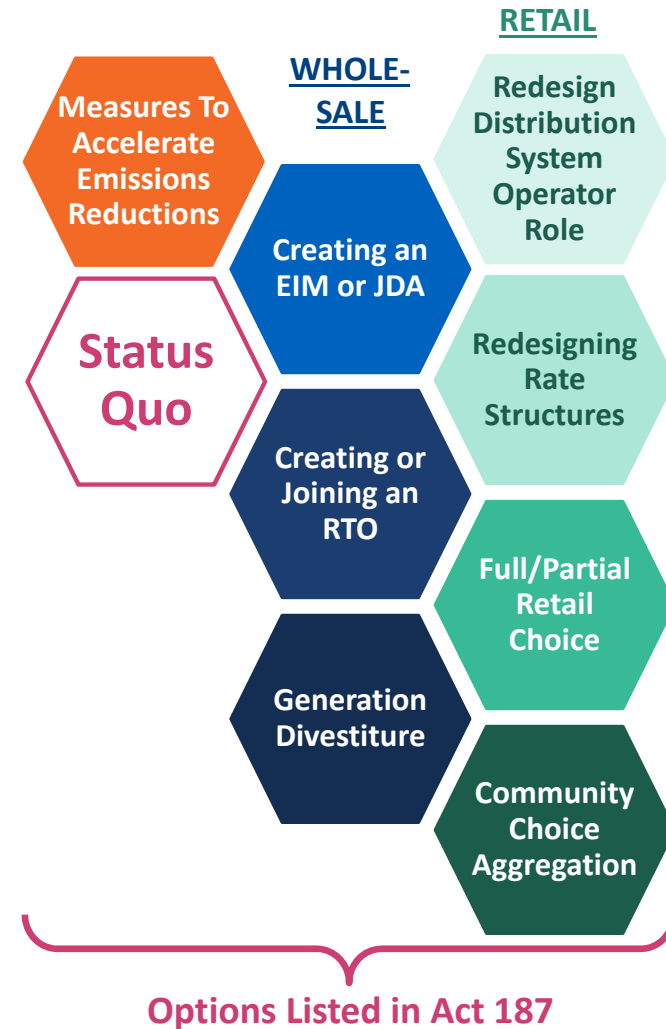
South Carolina's proposed market reform options target either the wholesale or retail electricity markets.



Wholesale Market Reform affects how electricity is generated and transported over the bulk power system to the distribution system.

Retail Market Reform affects how electricity sold to consumers.

Some of the reform options listed in Act 187 are policy measures that South Carolina can pursue even without market reform



MARKET REFORM OPTIONS

Market Reform Options – Wholesale Market Reform



| Key: | | | | | RTO/ISO | | | | | | |
|--|--------------|--|--|------------------|--|---------------------------|------------------------|--|---------------------------|------------------------|---------------------------|
| | No Change | | | | Generation Divestiture | | | | | | |
| | Some Changes | | | | RTO w/ Vertically Integrated Utilities | RTO w/ Capacity Contracts | RTO w/ Capacity Market | RTO w/ Energy-Only Market | | | |
| Significant Changes | | | | Bilateral Market | Enhanced Bilateral Market | Joint Dispatch | Imbalance Market | RTO w/ Vertically Integrated Utilities | RTO w/ Capacity Contracts | RTO w/ Capacity Market | RTO w/ Energy-Only Market |
| | | | | SC Today | SC w/ SEEM | Duke JDA | Western EIM | SPP/MISO | California | PJM/ISO-NE/NYISO | Texas |
| Reliability | | | | | | | | | | | |
| Generation Reliability | | | | | | | | | | | |
| Transmission Reliability | | | | | | | | | | | |
| Distribution Reliability | | | | | | | | | | | |
| Long-Term Planning | | | | | | | | | | | |
| Generation Planning | | | | | | | | | | | |
| Transmission Planning | | | | | | | | | | | |
| Distribution Planning | | | | | | | | | | | |
| Near-Term Operations | | | | | | | | | | | |
| Day-Ahead Unit Commitment | | | | | | | | | | | |
| Real-Time Dispatch | | | | | | | | | | | |
| Joint Transmission Tariff | | | | | | | | | | | |
| Spot Energy Purchases | | | | | | | | | | | |
| Reserve Procurement | | | | | | | | | | | |
| System Balancing | | | | | | | | | | | |
| Policy and Wholesale Regulation | | | | | | | | | | | |
| State Energy Policy | | | | | | | | | | | |
| State Regulation | | | | | | | | | | | |
| Federal Energy Policy | | | | | | | | | | | |
| Federal Regulation | | | | | | | | | | | |

MARKET REFORM OPTIONS

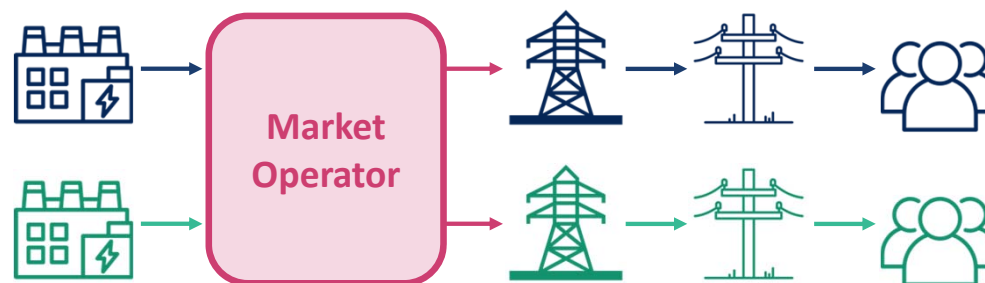
Market Reform Options – Retail Reform



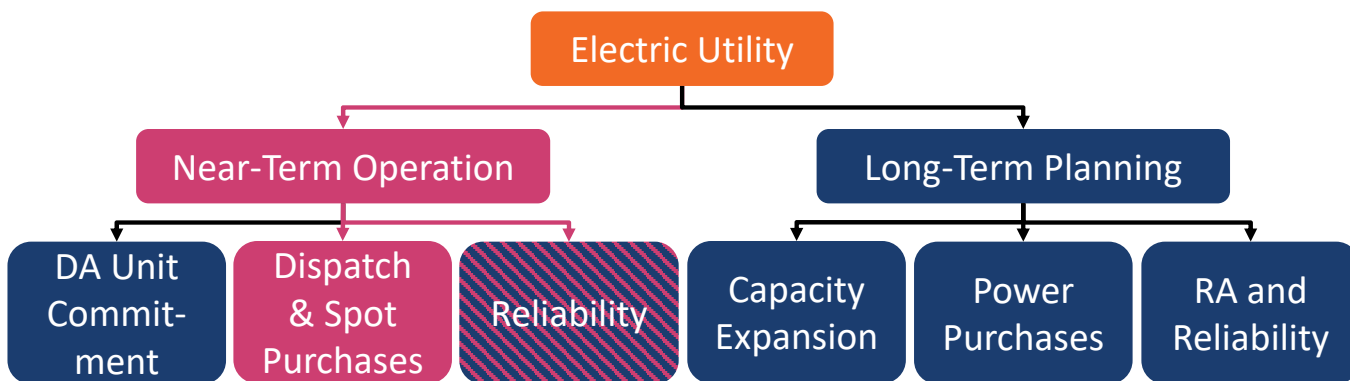
| | | | RTO | | | |
|-------------------------------------|------------------------------------|---|--|--|--|--|
| | | | Generation Divestiture | | | |
| Key: | No Change | Vertically Integrated Utility w/o Retail Choice | Vertically Integrated Utility w/ Partial Retail Choice | Divested Utility w/ Full Retail Choice (Incumbent Default) | Divested Utility w/ Full Retail Choice (Competitive Default) | Distribution System Operator (Distribution market) |
| | Some Changes | | | | | |
| | Significant Changes | | | | | |
| Example Jurisdictions: | | SC Today | GA, OR | Several States | Texas | None |
| Retail Functions | | | | | | |
| | Distribution Rate Design | | | Significant Changes | Significant Changes | Significant Changes |
| | Distribution Planning | | | | | Some Changes |
| | Distribution Ownership & Operation | | | | | Some Changes |
| | Distribution Cost Recovery | | | | | Some Changes |
| | Billing, Customer Support, etc. | | Some Changes | Significant Changes | Significant Changes | Significant Changes |
| Policy and Retail Regulation | | | | | | |
| | State Energy Policy | | | | | |
| | State Regulation | | Some Changes | Significant Changes | Significant Changes | Significant Changes |
| | Federal Energy Policy | | | | | |
| | Federal Regulation | | | | | |

In EIM/JDA, Utilities Pool Resources During Real-Time Operations

Ownership and Operational Impacts



Functional Impacts



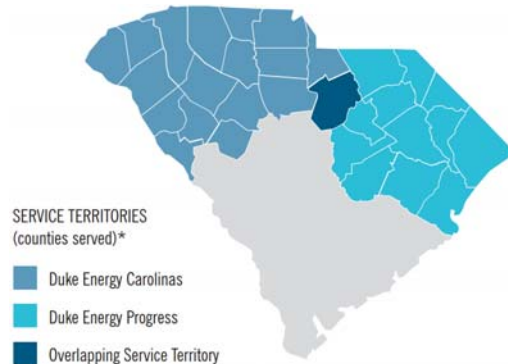
- Market operator optimizes real-time (RT) dispatch to serve demand with lowest-cost resources available (EIM also optimizes “nodal” transmission limits)
- Available transmission used in RT without fees
- Day-ahead operations and planning activities remain the same
- Transparent RT EIM prices provide clear operational and investment signals

MARKET REFORM OPTIONS -- WHOLESALE
 EIM and JDA Examples

Duke Energy Carolinas and Progress Energy Operate a JDA in the Carolinas.

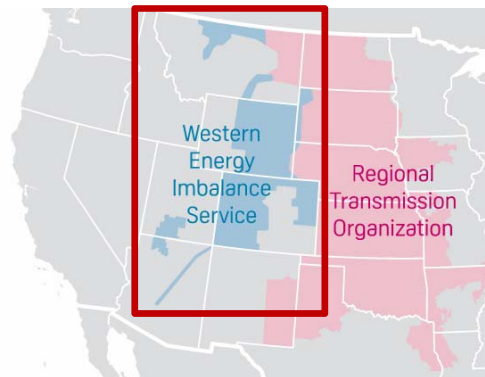
The SPP-run WEIS and the CAISO-run EIM are two nodally-optimized imbalance markets in the western U.S.

Duke Energy JDA in South Carolina



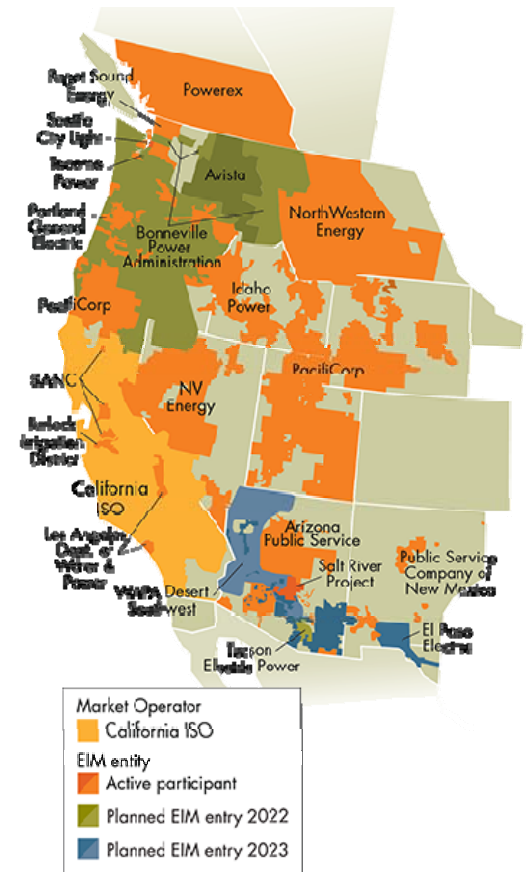
*Portions may be served by other utilities.
 Source: energy.sc.gov

SPP Western Energy Imbalance Service



Source: S&P Global

Western Energy Imbalance Market

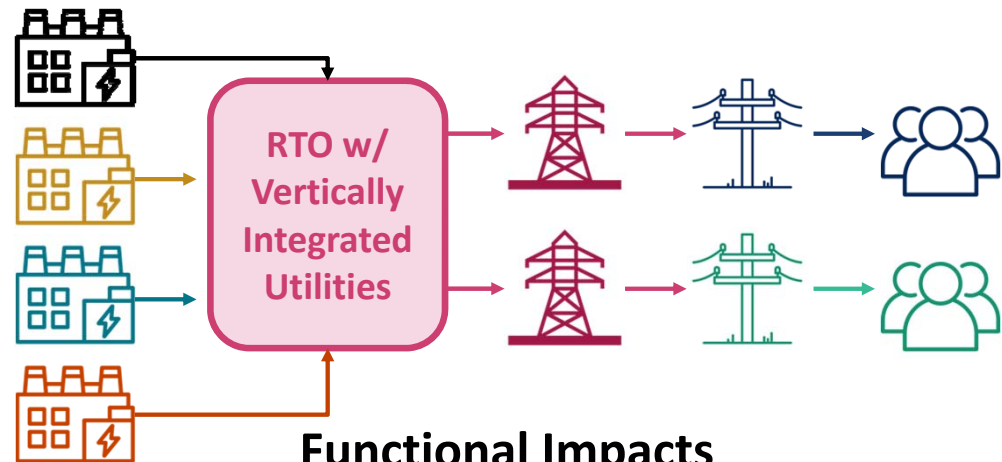


Source: westerneim.com

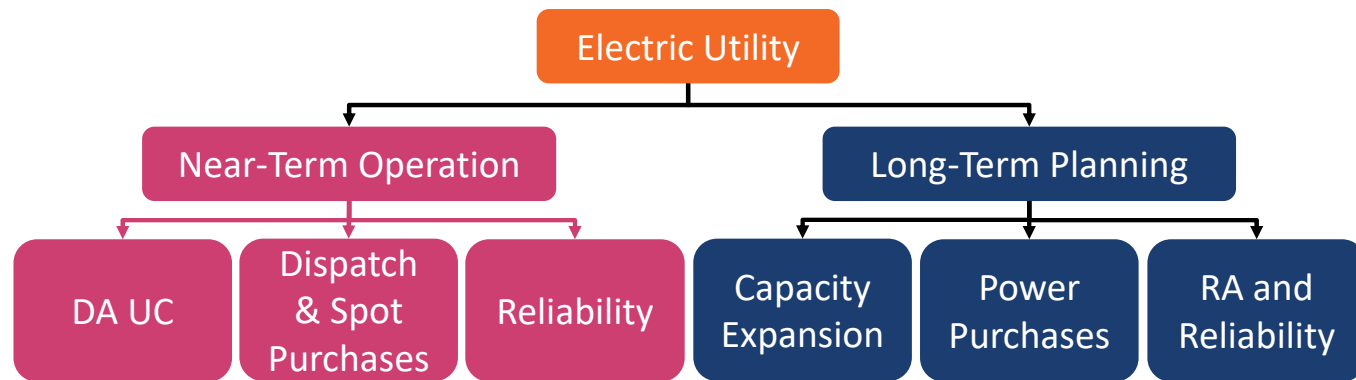
RTOs Optimize Generation and Transmission With Central Control

- Unit commitment, dispatch, and transmission fully optimized across day-ahead (DA) and RT
- Joint transmission tariff between members
- Transparent market pricing in DA and RT sends clear operational and investment signal
- Regionally-planned transmission investment

Ownership and Operational Impacts



Functional Impacts

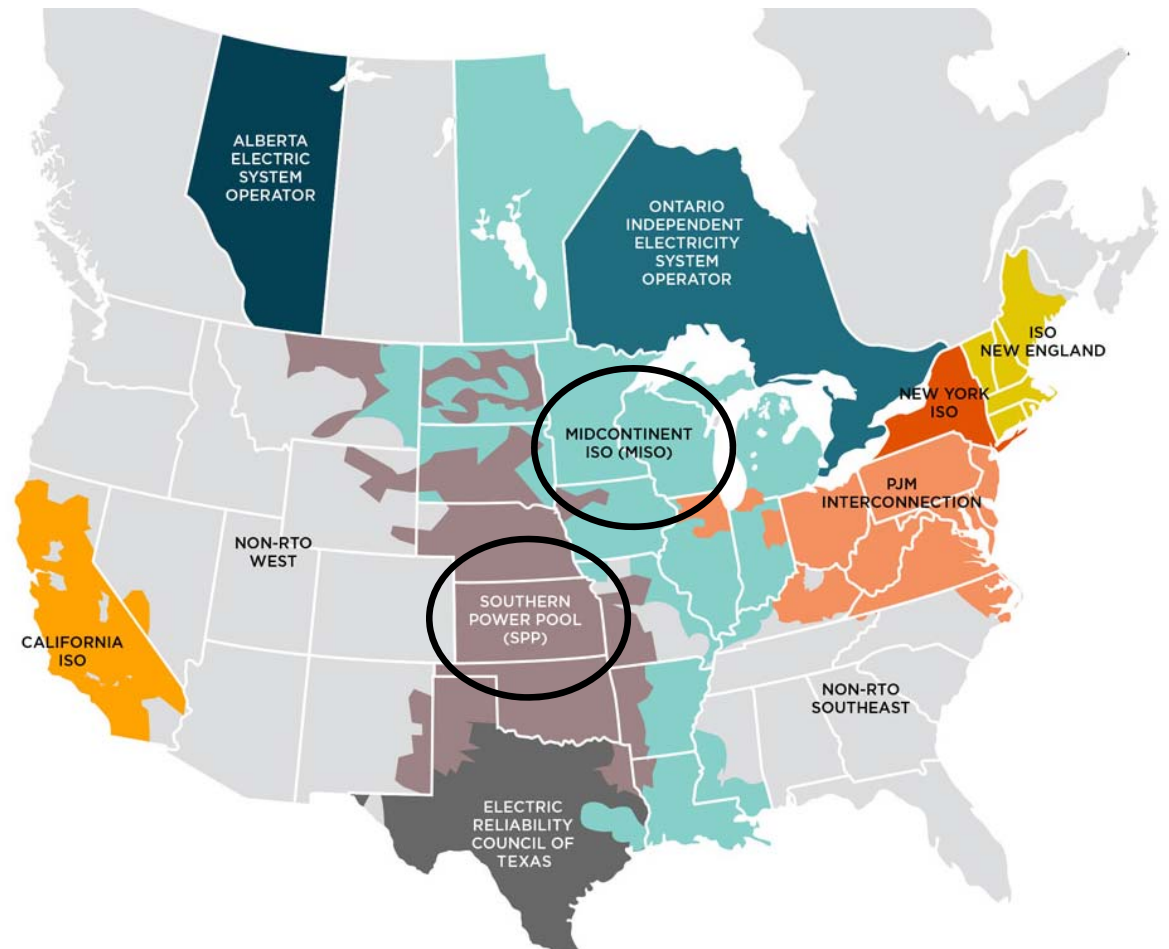


North American RTOs

Much of the North American grid is operated by RTOs

SPP and MISO are the U.S. RTOs with mostly vertically-integrated utilities

PJM, NYISO, ISO-NE include states with retail access and divested generation

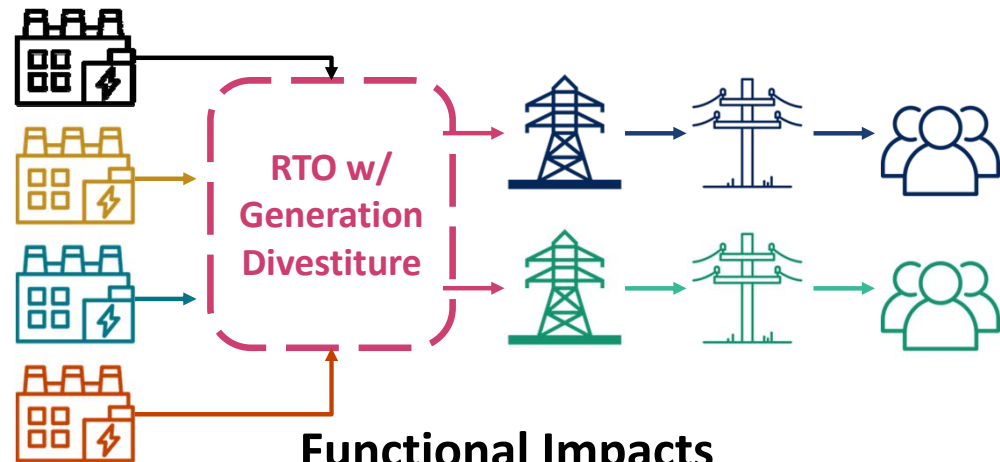


Source: FERC

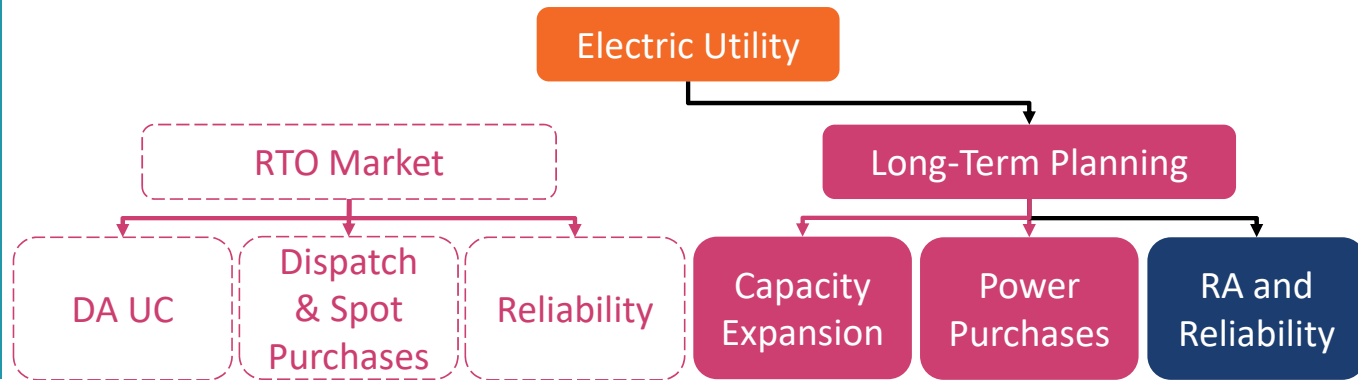
Generation Divestiture Changes Ownership

- Generators sell some or all of their generation assets and become “wires” companies
- IPPs own and operate generation, bidding it into RTO markets
- IPPs profit (or not) based on market prices
- Market forces incentivize entry/exit of generation resources (with Resource Adequacy impacts)

Ownership and Operational Impacts



Functional Impacts

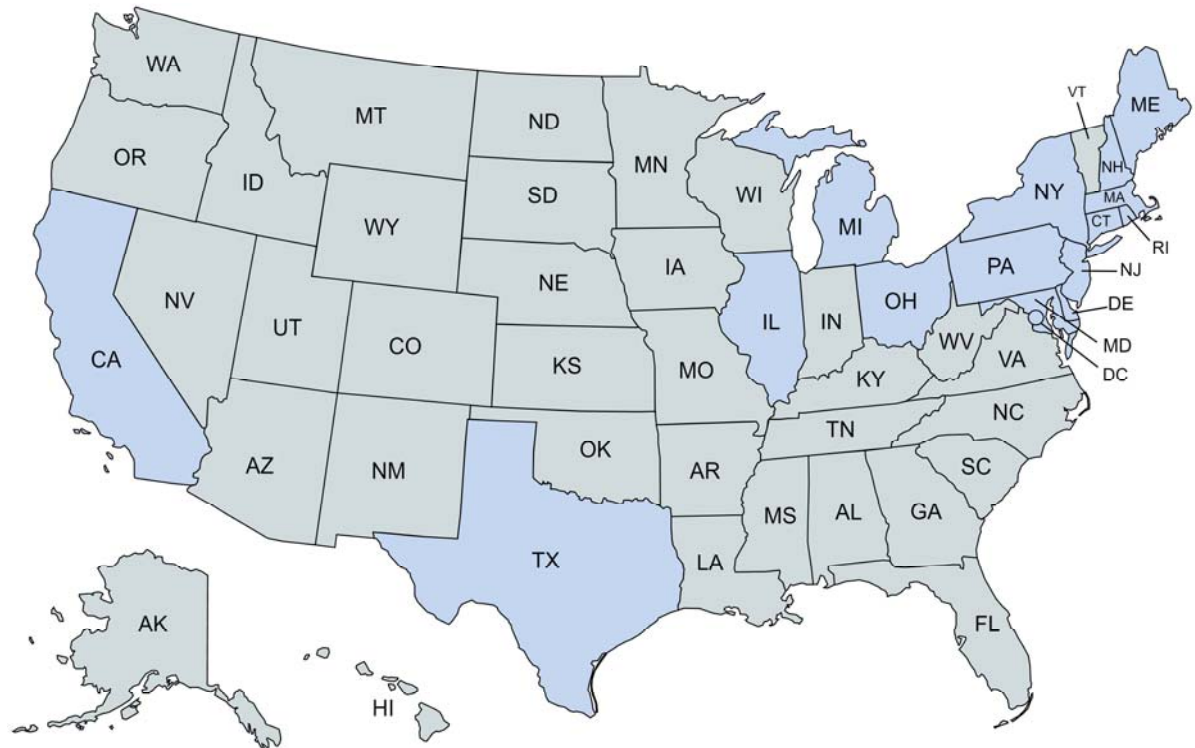


States With Generation Divestiture

Many states participating in regions with capacity markets (PJM, NYISO, ISO-NE) have divested generation.

In all states, except for TX and CA, that have divested generation also have capacity markets

States With Generation Divestiture

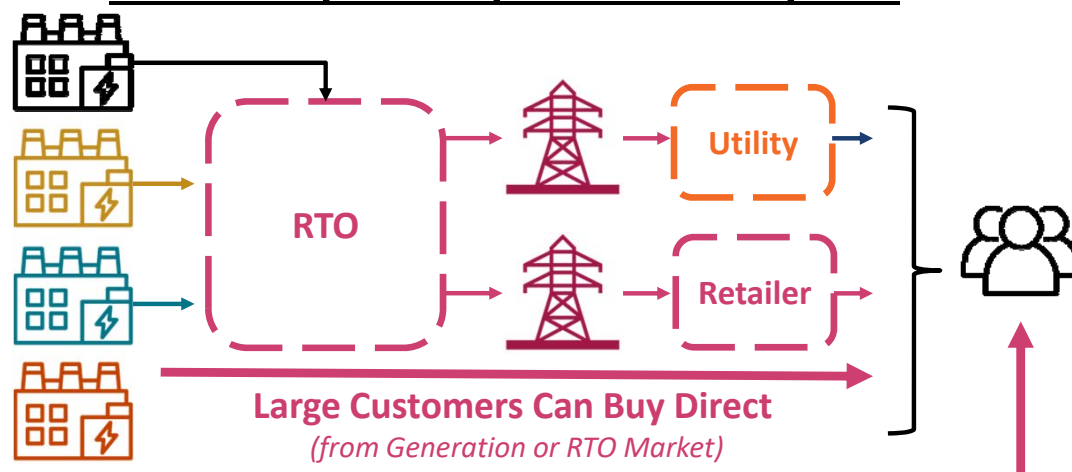


Source: [Harvard Electricity Policy Group](#)

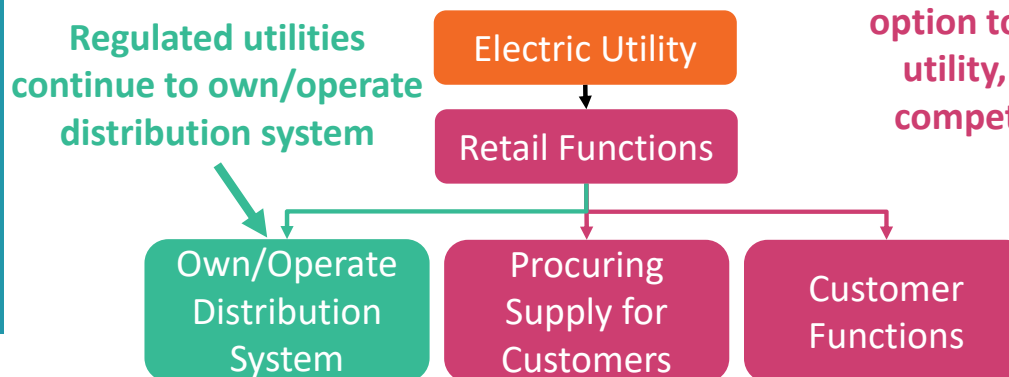
Under Retail Choice, Customers Choose Their Providers

- Full retail choice allows all types of customers to choose a competitive retail supplier; partial retail choice applies only to large C&I customers
- Utilities are “backup” providers of last resort
- Potential savings, but exposure to volatility
- RTO markets not necessary for partial retail choice; full retail choice requires a wholesale market

Ownership and Operational Impacts



Functional Impacts



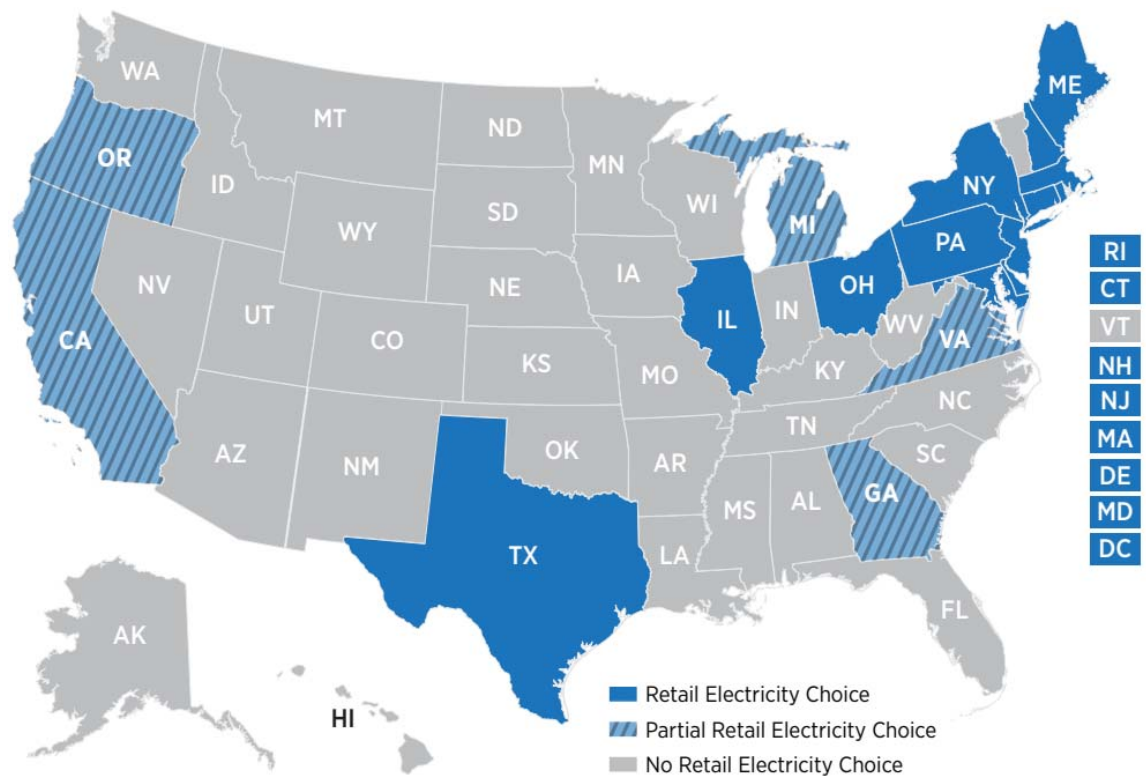
Examples of Areas With Full or Partial Retail Choice

States with full retail choice all participate in a RTO markets

Some states with very limited retail choice are not in RTO markets (e.g., GA and OR), but this is uncommon

Many states without retail choice participate in ISO/RTO or EIM markets

States With Retail Choice As Of 2017

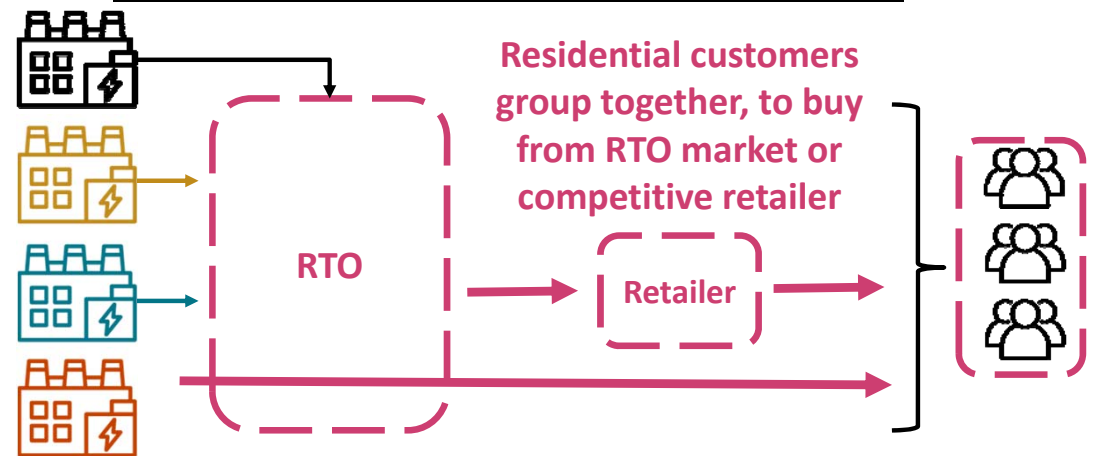


Source: [NREL](#)

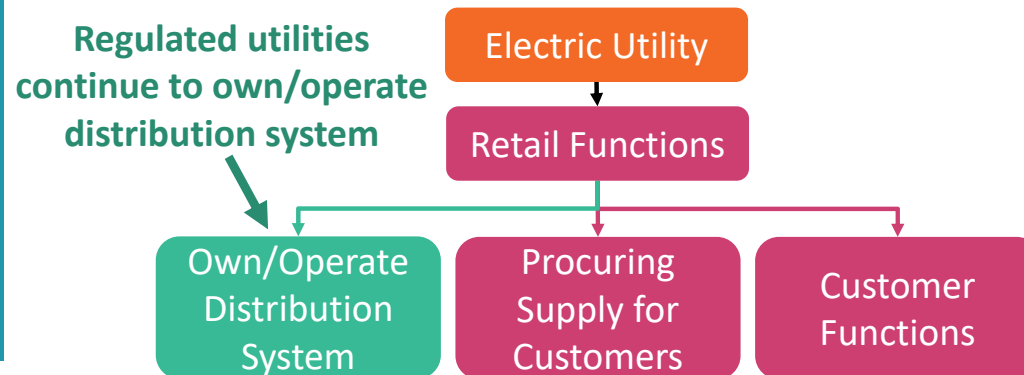
Under Retail Choice, Customers Choose Their Providers

- Customers group together to obtain bargaining power with competitive suppliers, or buy directly from the market
- Typically, residential communities or municipalities offer CCA programs to their residents
- CCAs are frequently used to purchase renewable energy from competitive supplier

Ownership and Operational Impacts



Functional Impacts

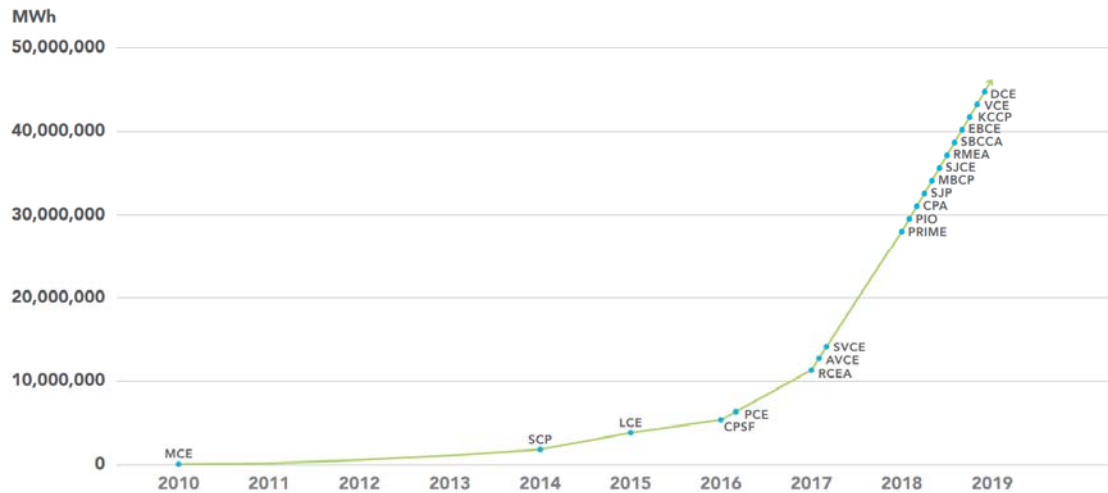


MARKET REFORM OPTIONS -- RETAIL

California CCA Programs

200 cities and communities, accounting for about 25% of California retail sales, participate in CCA programs (as alternative to legislatively-restricted retail choice for individual customers).

California CCA Load Growth



Source: [Next 10](#)



Source: [CalCCA](#), [S&P Global](#)