Western Area Power Administration

Energy Markets

Al Austin – Technical Lead, Power System Operations

Date – 5/30/18

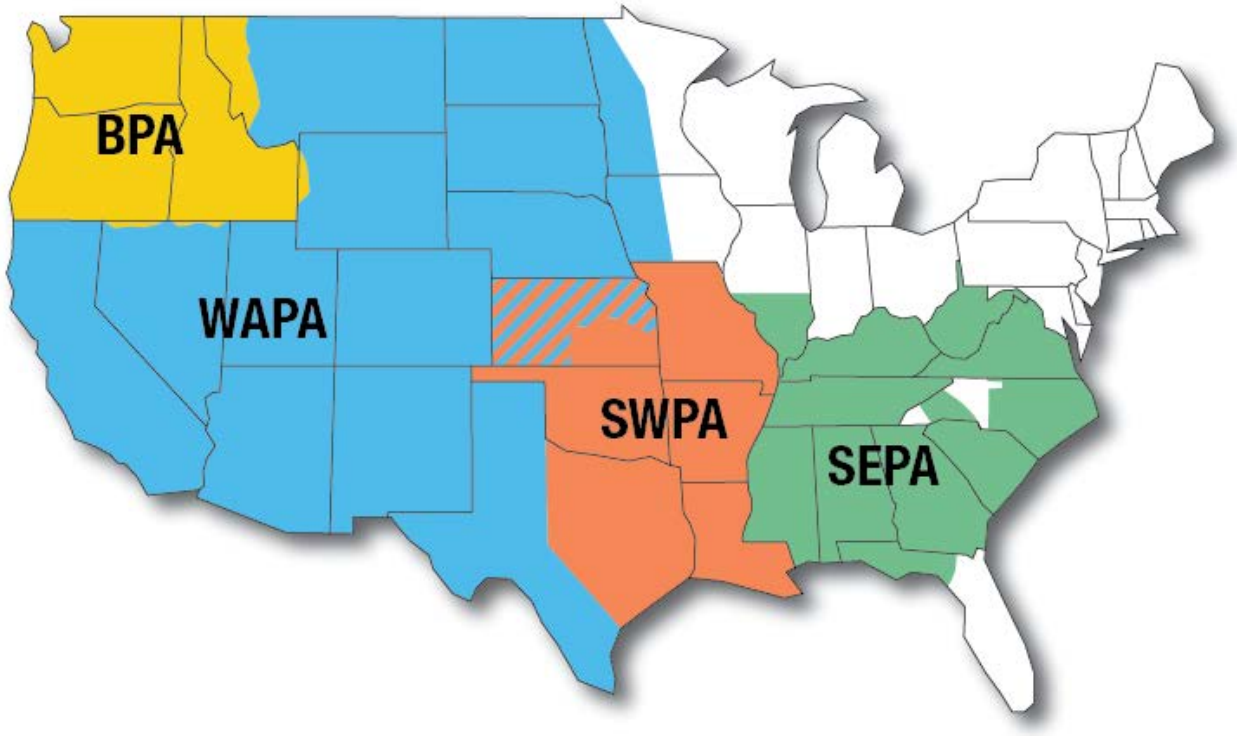
DOE Tribal Webinar

What is WAPA?

- Market, transmit, and deliver low-cost, reliable, and clean hydropower to federal preference customers

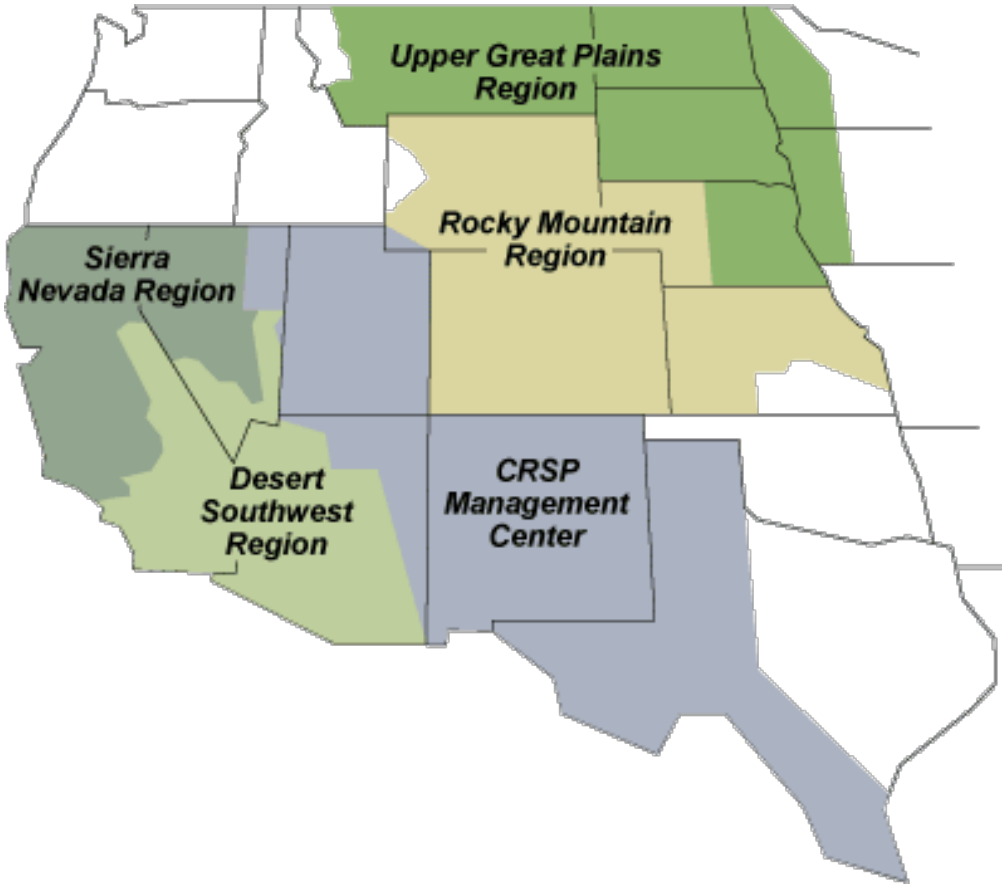
- Over 700 customers
  - Cities and towns
  - Rural electric cooperatives
  - Irrigation districts
  - Public power districts
  - Federal and state agencies
  - Native American tribes

One of four (4) Power Marketing Administrations

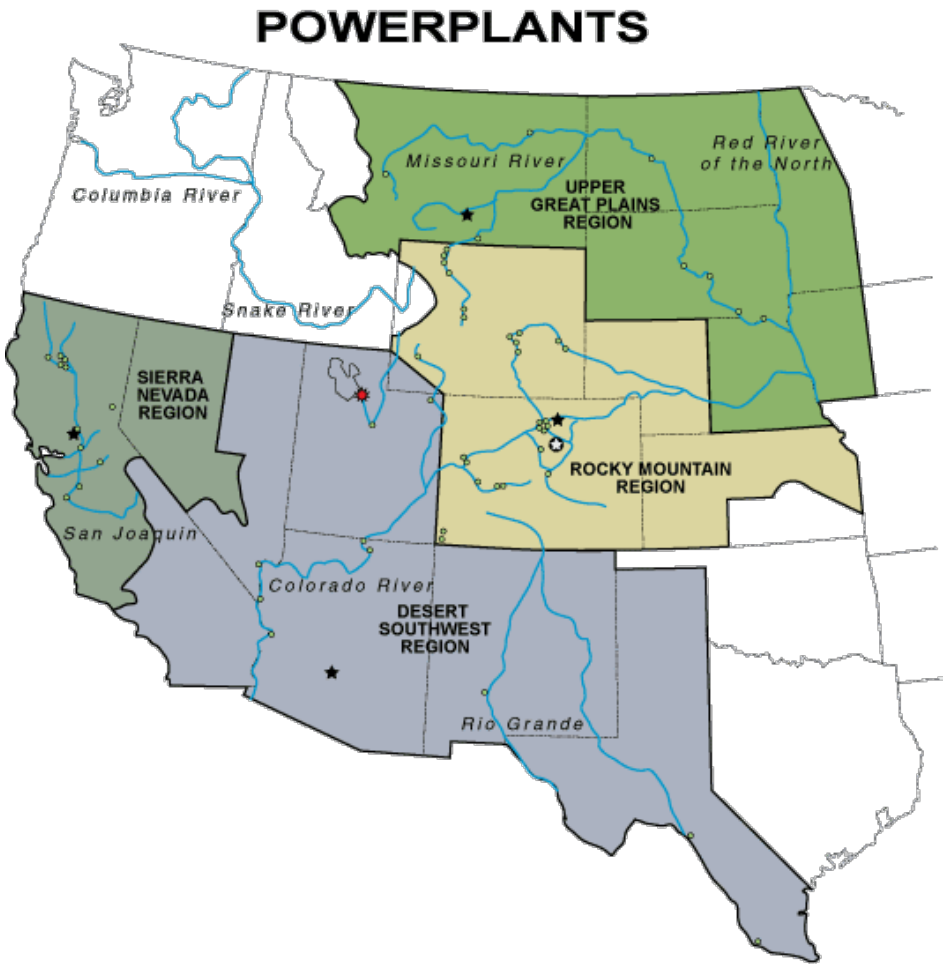


Our service territory

- Serving customers in 15 states from 4 regional offices
- 56 hydropower plants
- 10,479 MW of installed capacity
- 17,107 miles of high voltage transmission lines



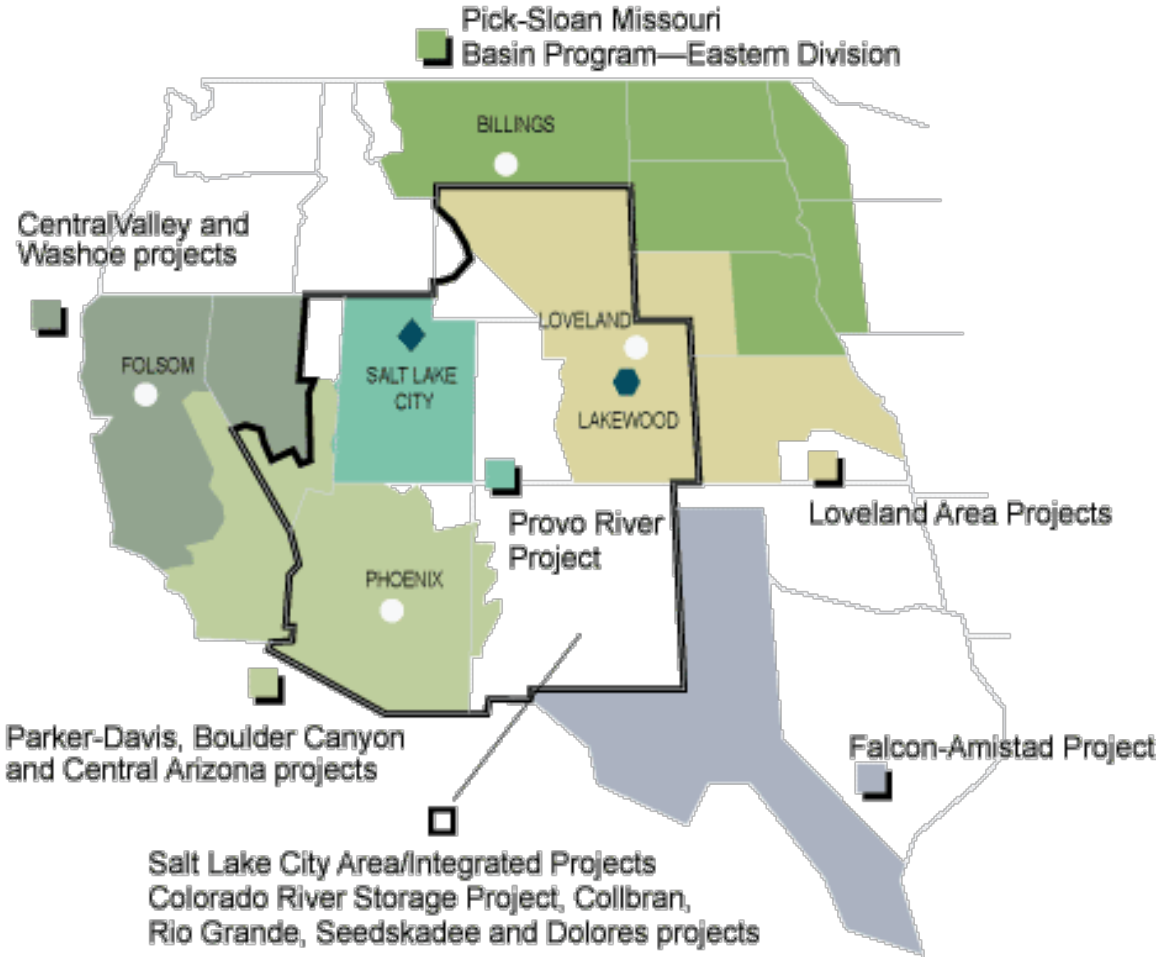
Our power comes from



- Hydroelectric energy produced at Federal generating agencies
- Multi-purpose projects
- Variable water availability

WAPA's hydro projects

- Power marketed on a project-specific basis
- Marketing plans developed through public processes
- Normally consist of:
  - Marketing criteria
    - How power is sold
  - Allocation criteria
    - Who receives power
    - No total load requirement



Energy Management Services that WAPA provides:

- Supplemental energy procurements
- Contract negotiations
- Scheduling services
- Resource management and optimization
- Demand forecasting
- Develop market bidding strategies
- Real Time monitoring and mitigation
- Planning (short, mid, & long term)

Questions?

Today's Agenda

- Overview of the Electricity supply chain and where you fit in
- Energy Availability & Affordability…two forces that affect markets
- Energy Market Basics
- Opportunities for tribes
- Where do you go for help?

The energy landscape in the US is in transition

- CAISO Energy Imbalance Market is expanding
- Utilities in the west are exploring market options
- Community Choice Aggregation is expanding in California
- Wholesale prices for Solar & Wind energy are comparable with Natural Gas
- Large Las Vegas Casinos pay millions of dollars to leave NVEnergy
- Expansion of wind and solar supplies in California has posed operational challenges for the Grid Operator.
- Grid Operators are looking for new technologies to integrate renewables into their systems.
- People want choice!!

"Yeah, that's interesting, but what does it mean to me?"

That depends on where you fit into the energy supply chain?

- We are all consumers of some sort
- Do you self-supply?
- Are you a tribal utility?
- Do you have any co-gen?
- Do you take transmission service?
- Is your load residential, commercial, industrial?

…and what your energy goals are?

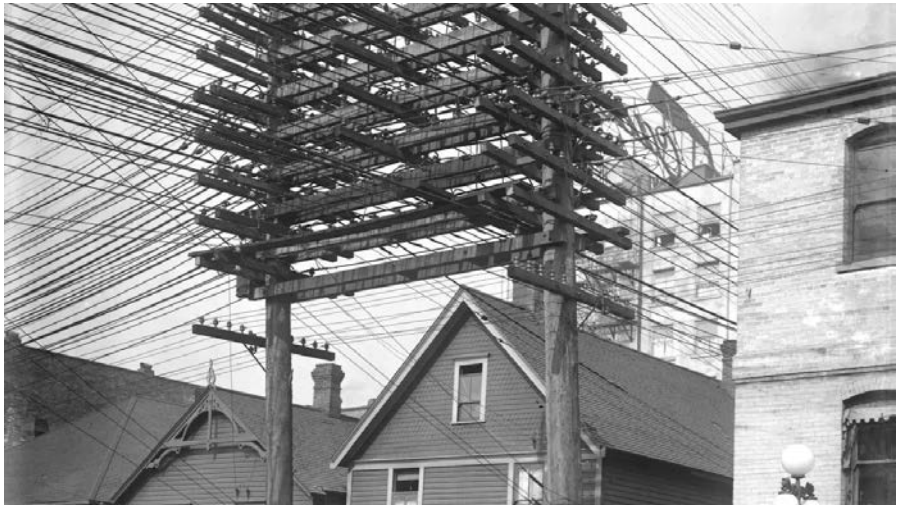
- Be a more responsible and informed consumer
- Maintain long term price stability
- Supply assurance
- Be more environmentally conscious
- Generate revenue/jobs
- ???

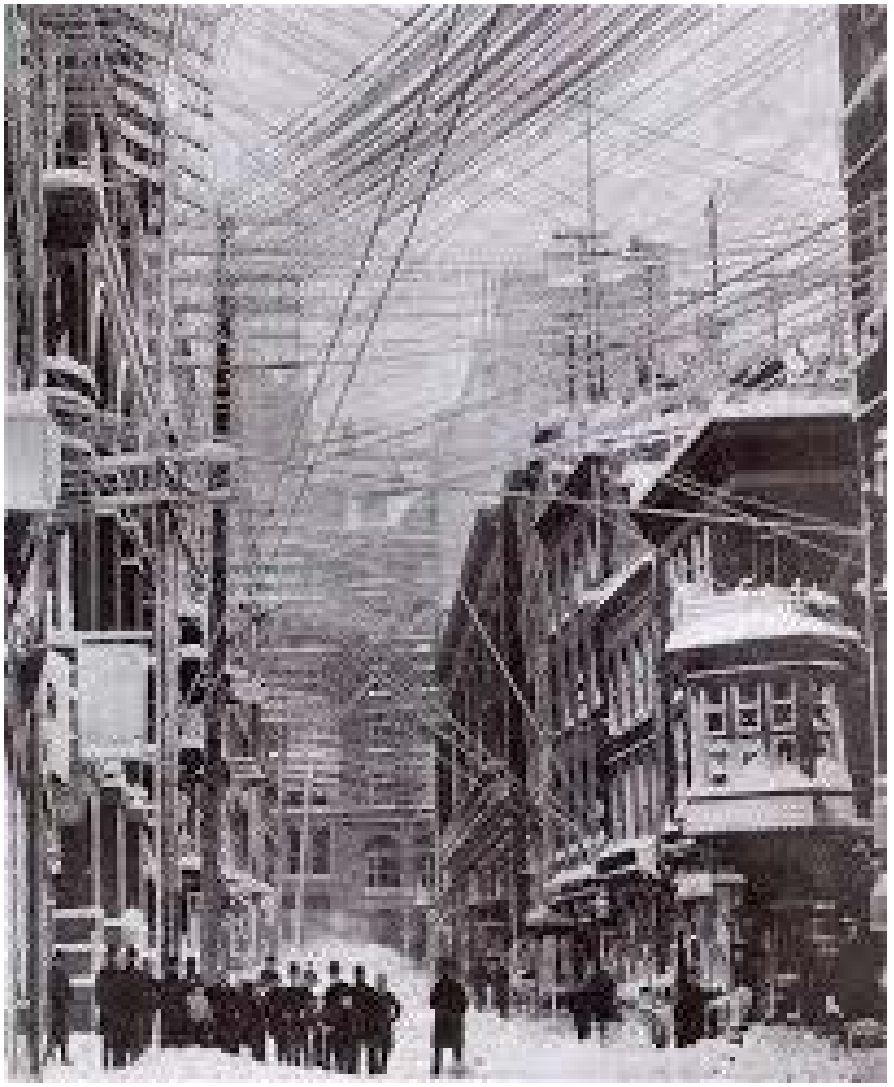
If you don't have well defined goals, then you need to develop a plan!

Some Facts about Electricity

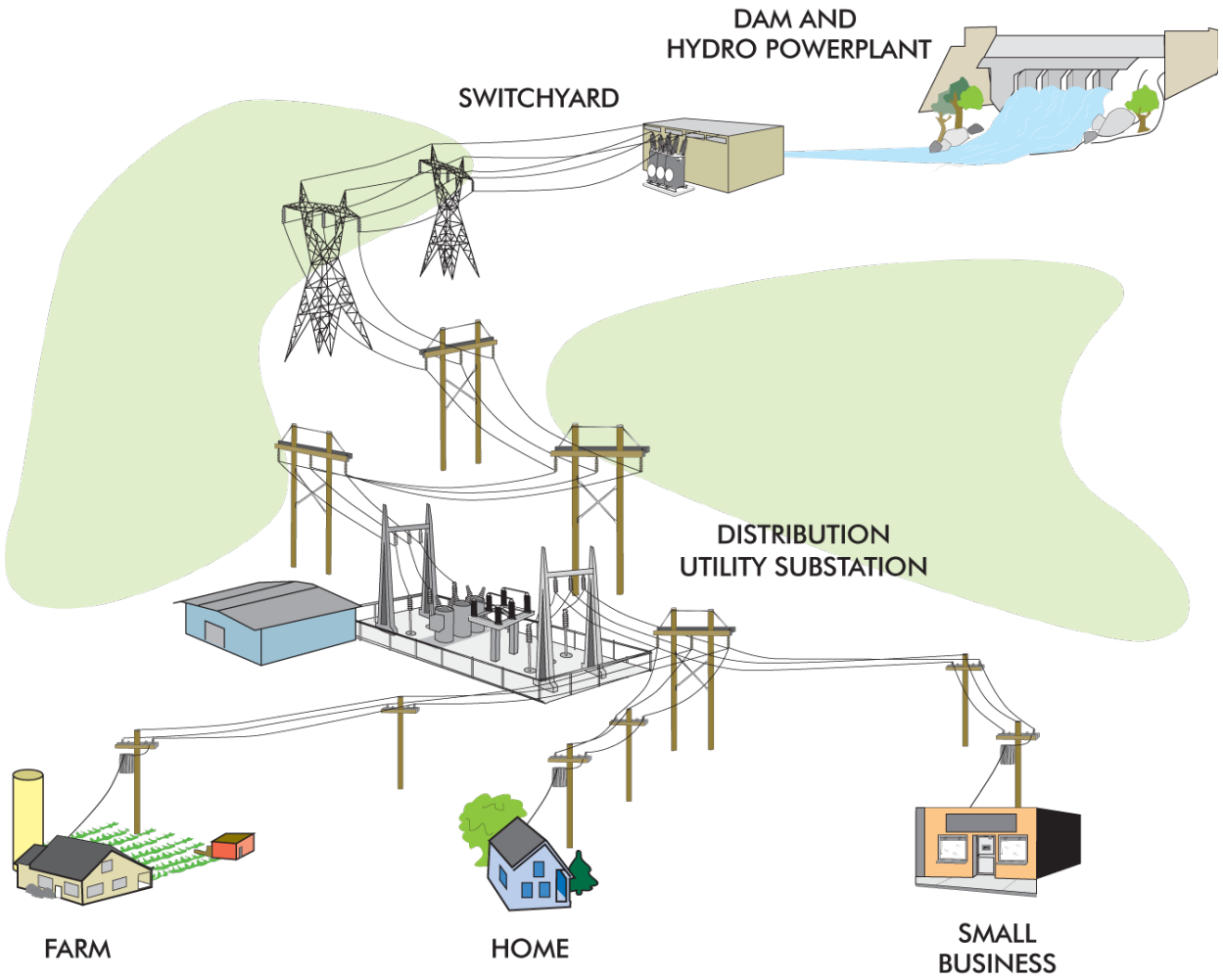
- Electricity requires a physical path (wires) to move from one place to another. There is no “wireless” electrical network.
- Storing electricity (at least on any large scale) has been impossible up until recently.
- The physics of electricity require a constant balance between supply and demand or bad things can happen
- Producing electricity and the necessary supporting infrastructure is a capital intense effort

Too many wires!!

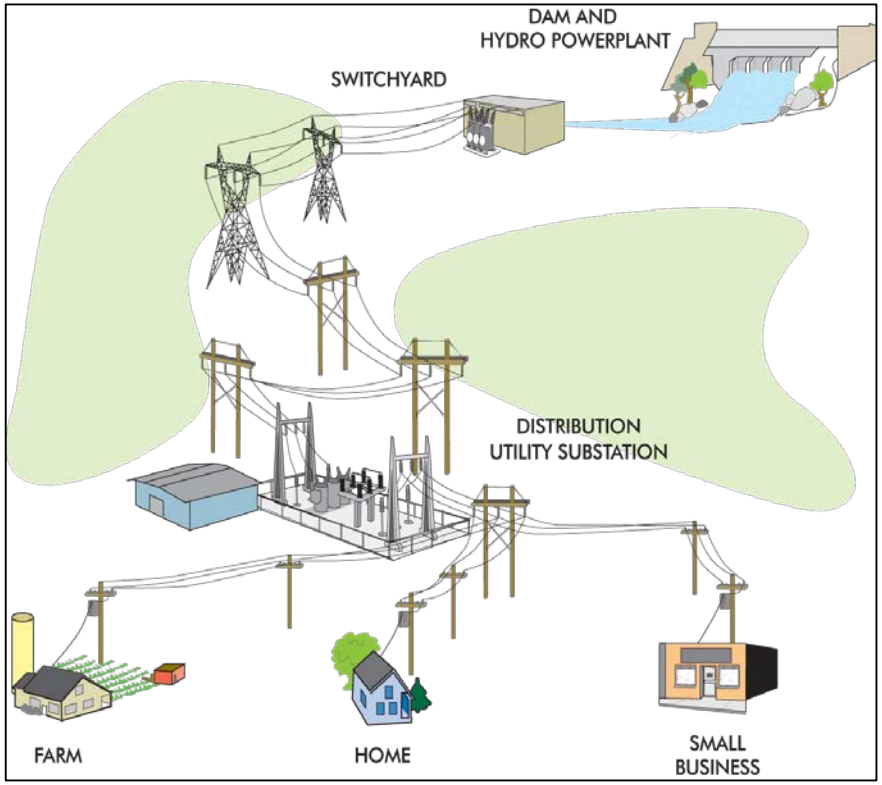


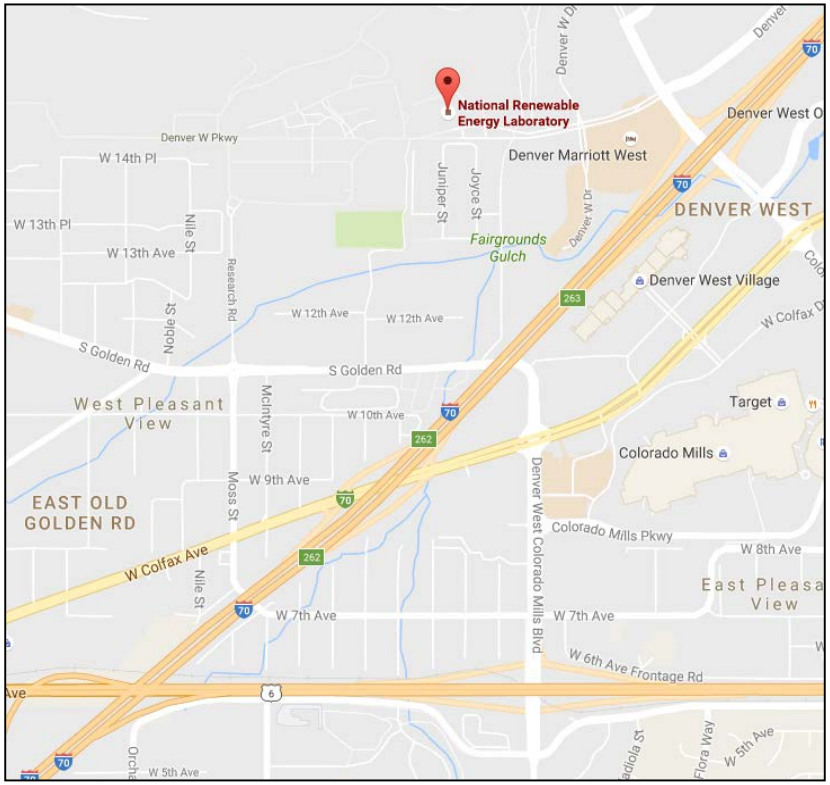


The Power Grid



Power Grid is similar to our roadways



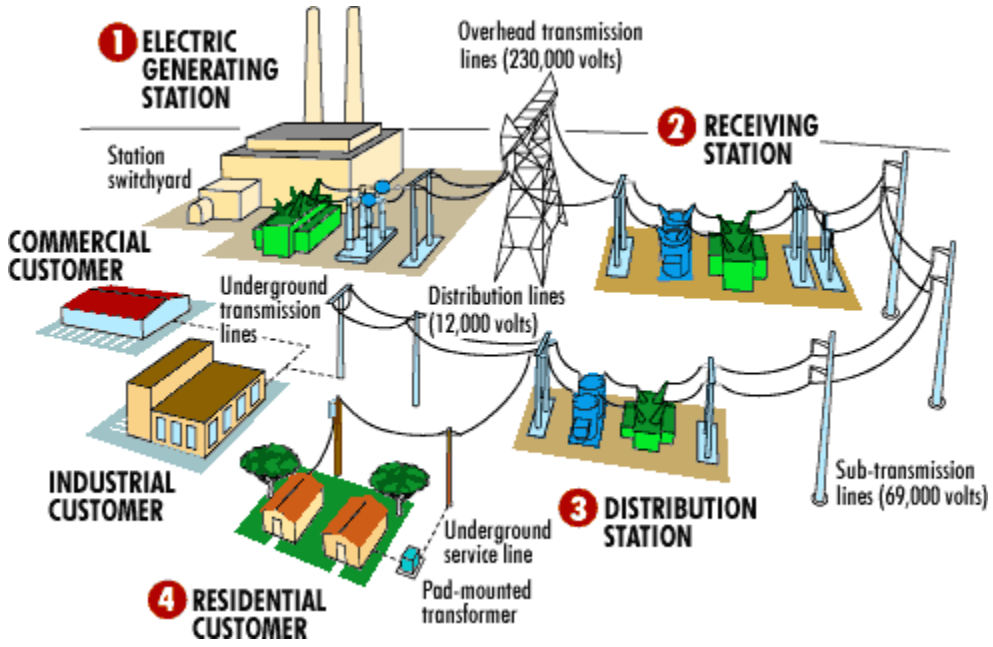


The high voltage transmission system is like our interstate highway system, while The distribution system is like our city streets.

The Energy Supply Chain

Where do you fit in?

- Generation “Supply”
- Transmission
- Distribution
- Consumption “Load or Demand”



Questions?

Two competing demands that affect the Supply Chain

- Reliability – the demand for a reliable, safe, and constant supply of electricity all at "the flip of switch"
- Economics – the demand for affordable, least-cost products and services

Reliability…who's operating the grid?

- The North American Electric Reliability Corporation (NERC) is the organization whose primary focus is the reliability of the power grid.
- NERC was formed after the Northeast blackout of 1965.
- Developed a functional model that defines roles and tasks that must be performed to ensure reliable operations.
- Develops and Maintains a set of Reliability Standards that establish how the grid should be operated.
- NERC can levy sanctions for non-compliance

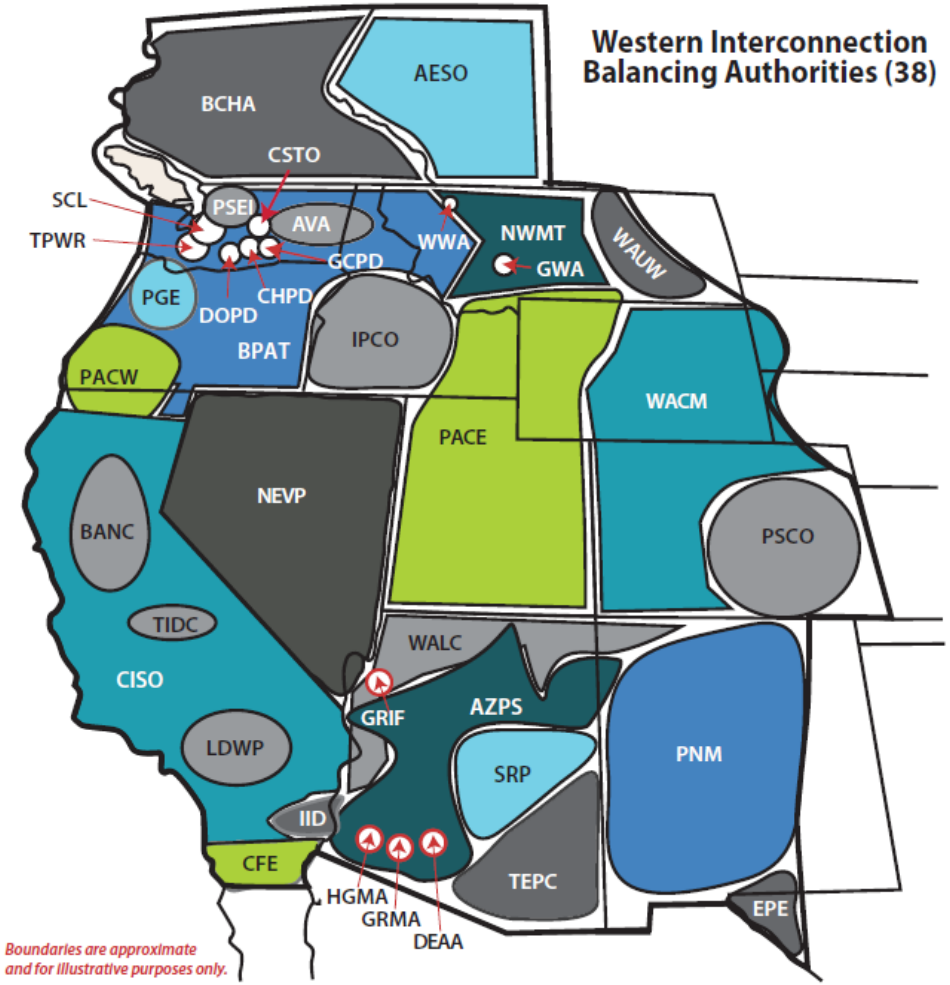
NERC Functional Areas

- Generator Owner/Operator
- Transmission Owner/Operator/Service Provider
- Distribution Provider
- Load Serving Entity

Balancing Authority

- Entity that is responsible for running a specific portion of the power grid
- Maintain balance between Resources (Supply) and Loads (Demand)
- Manage energy flows between BAs and on all their transmission lines
- Must adhere to stringent reliability standards
- Assure ancillary services are in place

Balancing Authorities in the West



Common Utility Functions/Responsibilities

- Maintain adequate supply of resources to serve demand obligations
- Construct and maintain transmission and distribution networks (the wires)
- Meet all NERC reliability standards
- Plan for future load growth
- Provide transmission services under a FERC filed tariff
- Establish Rates through regulated process

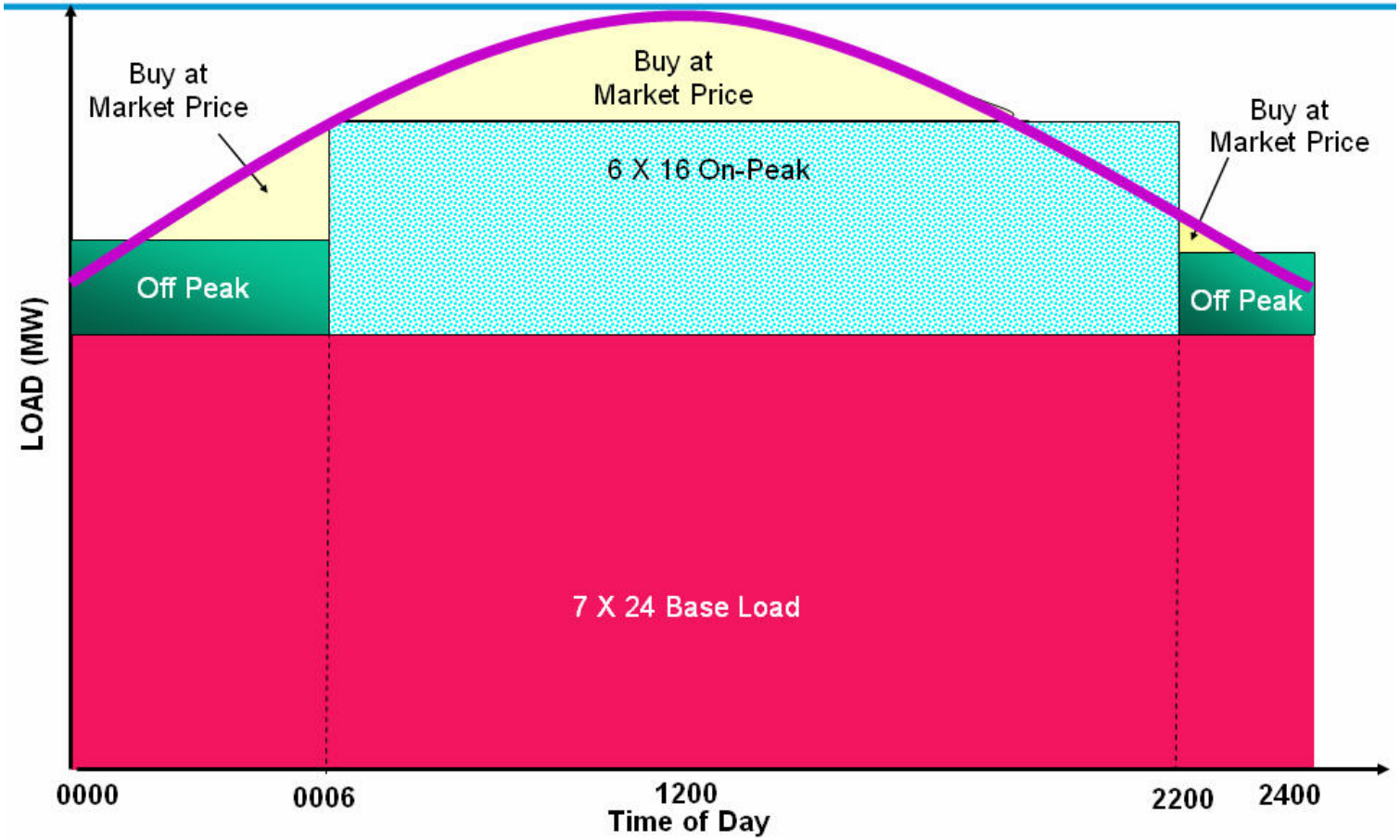
How do utilities secure a reliable, low cost supply of energy?

- Forecast their demand obligations (load & exports)
- Develop a day ahead plan to meet energy and ancillary service requirements
- Identify resources they have available to meet the demand (internal generation, imports, purchases)
- Economically dispatch resources
- Make adjustments in real time to account for changes to demand and resources

Bi-Lateral Markets

- Utilities constantly compare wholesale market prices relative to their own production costs and will buy/sell accordingly.
- Different time horizons – Forward, Day Ahead, Real Time (hour ahead)
- Transactions priced at $/MWh.
- Limited sub-hourly volumes
- Contracts are settled directly with counterparties
- Liquidity can be limited depending on location

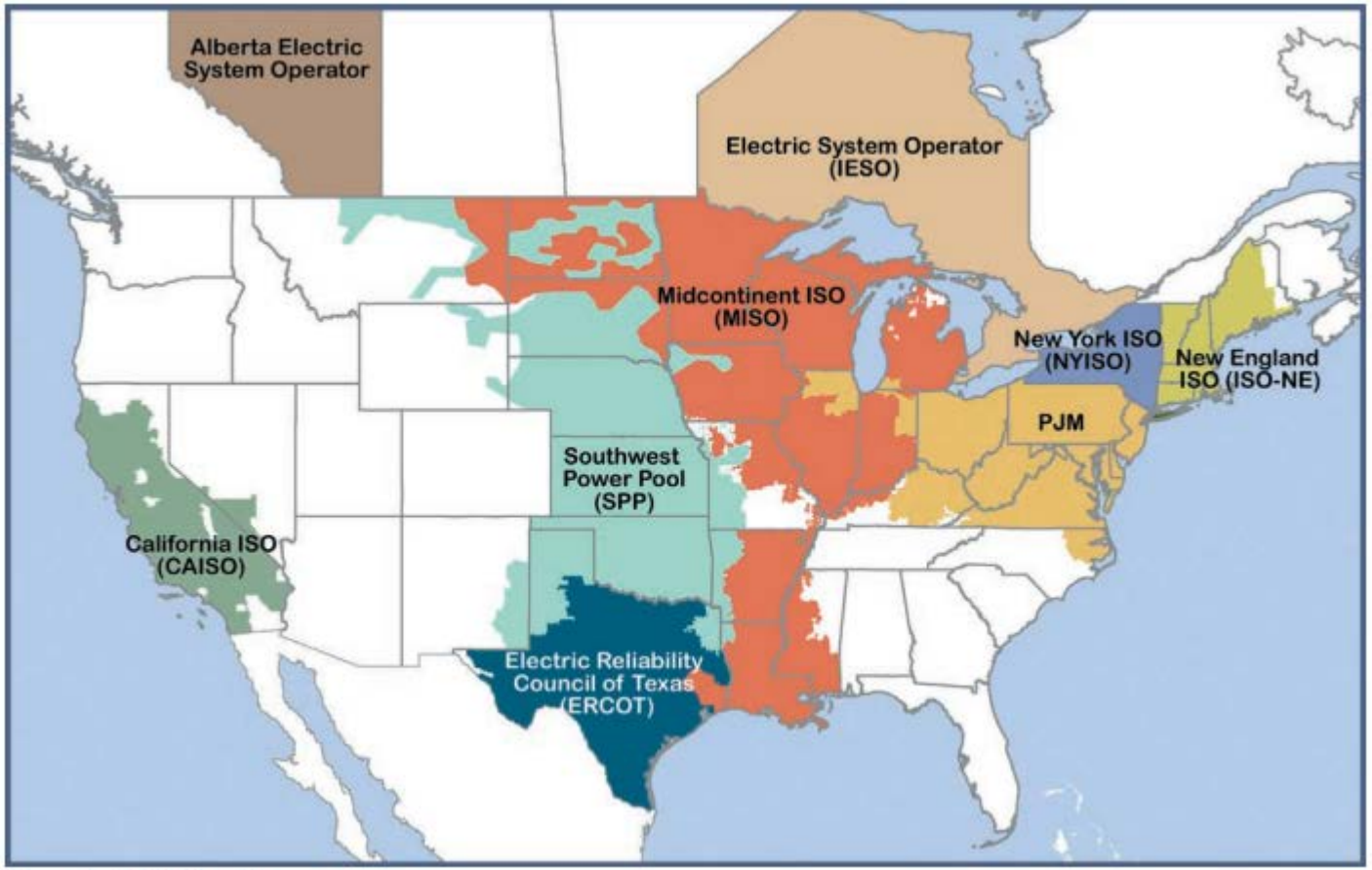
Developing a Supply Plan



Bilateral vs Centralized Markets

Bilateral Markets	RTO Centralized Markets
One party sells to another party (like buying a car)	Electricity products cleared by a centralized market operator (like the stock market)
Hourly transactions - poorly matched to increasing amounts of renewable generation	5 minute transactions - much more responsive to changing system conditions
Fragmented operating footprints result in capital and operating inefficiencies	Larger operating footprints with diverse resources are more efficient and more reliable
Limited visibility to conditions on neighboring systems can create reliability issues	Wide area situational awareness and control of the system has reliability benefits

RTOs in North America

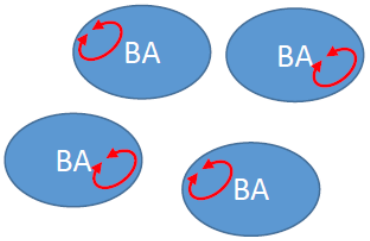


Source: Velocity Suite, ABB

How is a centralized market different than what we have now?

Without a market

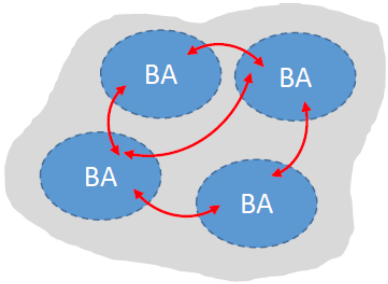
Each BA must balance loads and resources **within its borders.**



- Poor situational awareness & control
- Limited pool of balancing resources
- Inflexibility
- Hourly scheduling and dispatch
- High levels of reserves
- Economic inefficiencies
- Increased costs to integrate wind/solar

In a market

The market dispatches resources across BAs to balance energy



- Advanced situational awareness & control
- Diverse pool of balancing resources
- Increased flexibility
- Five minute dispatch
- Decreased levels of regulating reserves
- More economically efficient
- Decreased integration costs

What is an RTO?

- An independent operator of the transmission system and generation resources – no ownership of transmission/generation
- Maintains a wide-area overview of the entire footprint
- Operates and oversees a centralized market for energy and ancillary services
- Typically is the reliability Coordinator (RC)
- Facilitates transmission planning
- Performs Market Monitoring

What is the difference between an RTO and the CAISO EIM?

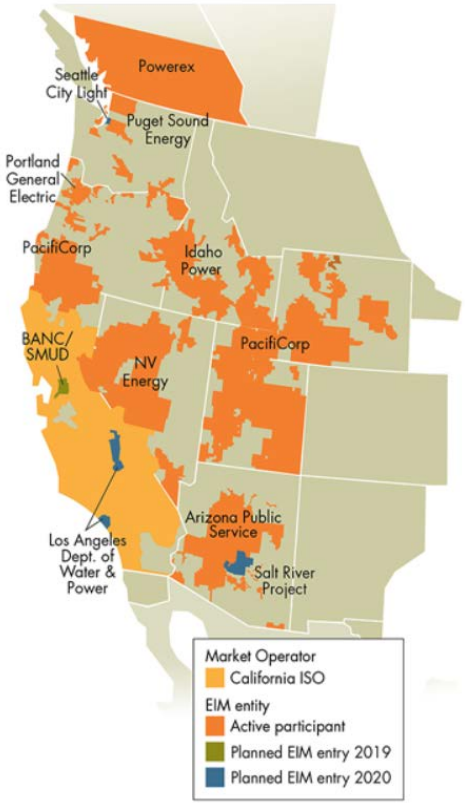
RTO

- Energy and ancillary services
- Day ahead and Real Time
- Responsible for all BA functions
- Transmission operations and planning
- Administer transmission tariff
- Balance loads and resources across entire footprint

EIM

- Limited to real time balancing energy only
- BAs responsible for their own ancillary services and all other BA functions
- Bi-Lateral transactions for all non sub-hourly transactions

Other Initiatives in the West



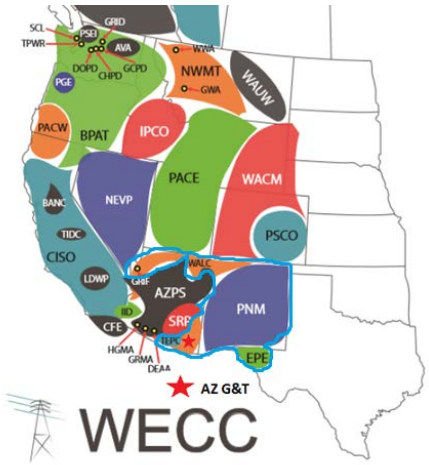
EIM

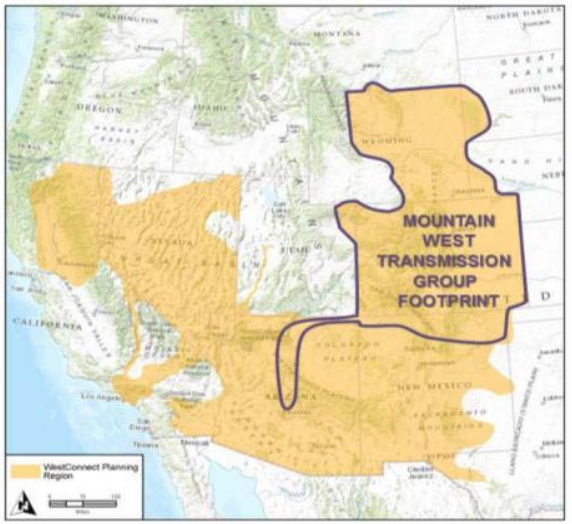
SMAG

MWTG

PEAKRELIABILITY
assuring the wide area view

pjm | Connext
Energy Innovations and Solutions





What are some of the options for Tribes?

- Develop an energy plan
- Explore partnership opportunities with your host utility
- Self Supply
- Form a tribal utility
- Get to know where you fit in the supply chain and what that means
- Engage with other tribes

Thank you…

Resources

- **DOE** Tribal programs

  https://energy.gov/indianenergy/office-indian-energy-policy-and-programs

- **Energy 101 (US Department of Energy)**

  https://www.energy.gov/oe/information-center/educational-resources/electricity-101

- **Energy Primer – A Handbook of Energy Market Basics**

  https://www.ferc.gov/market-oversight/guide/energy-primer.pdf

- **US Energy Markets in Transition**

  http://www.powermag.com/u-s-electric-markets-transition/

- Al Austin
  (602) 605-2502
  Austin@wapa.gov