



Western  
Area Power  
Administration

# Civilization, renewable energy, WAPA and the grid

November 14, 2016

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Administrator and CEO



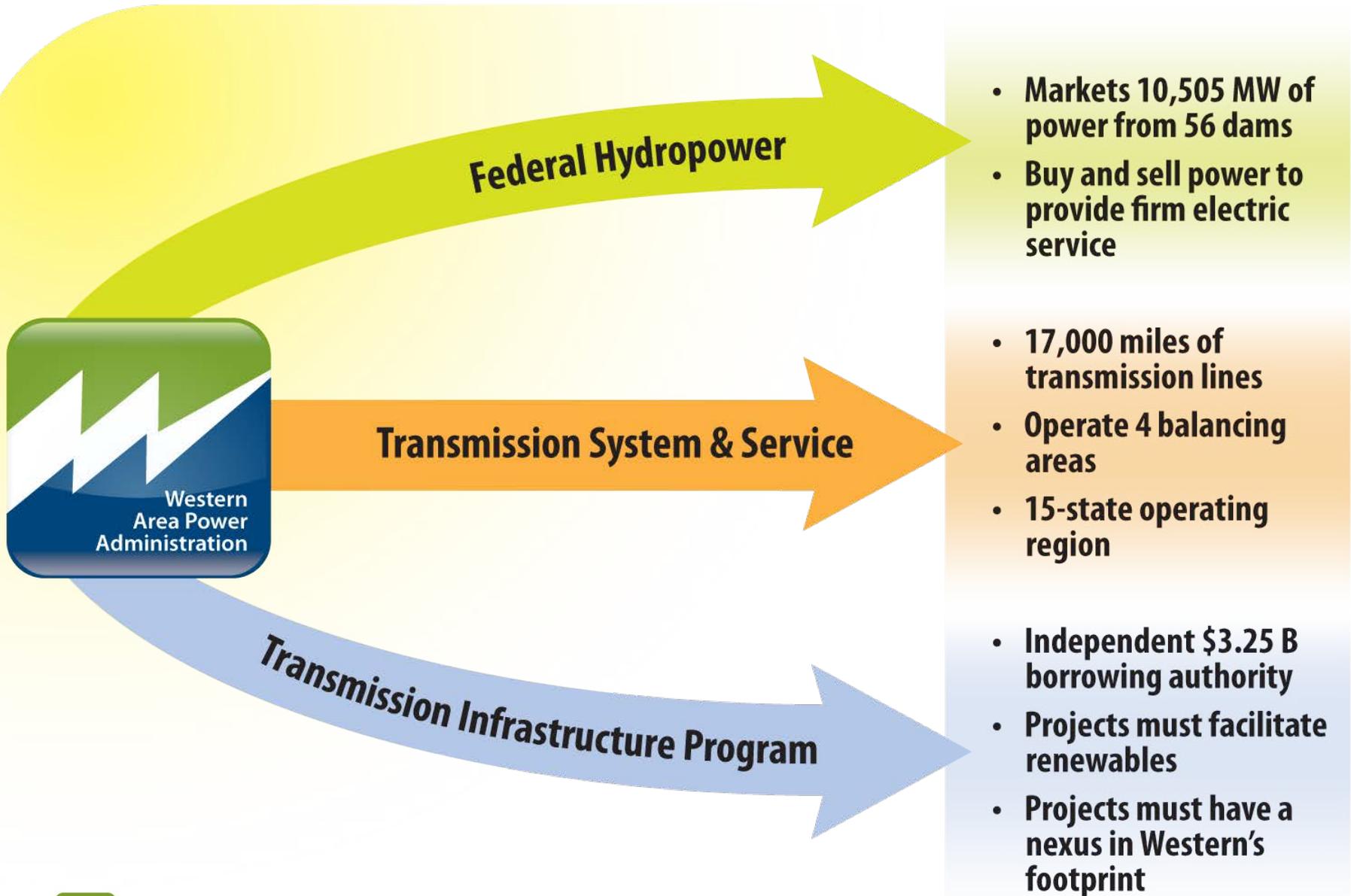
# What is WAPA?

One of four power marketing administrations within the U.S. Department of Energy whose role is to market and transmit wholesale electricity from multi-use water projects

- **Our mission:** Market and deliver clean, renewable, reliable, cost-based federal hydroelectric power and related services
- **Our vision:** Continue to provide premier power marketing and transmission services to our customers, as well as contribute to enhancing America's energy security and sustaining our nation's economic vitality

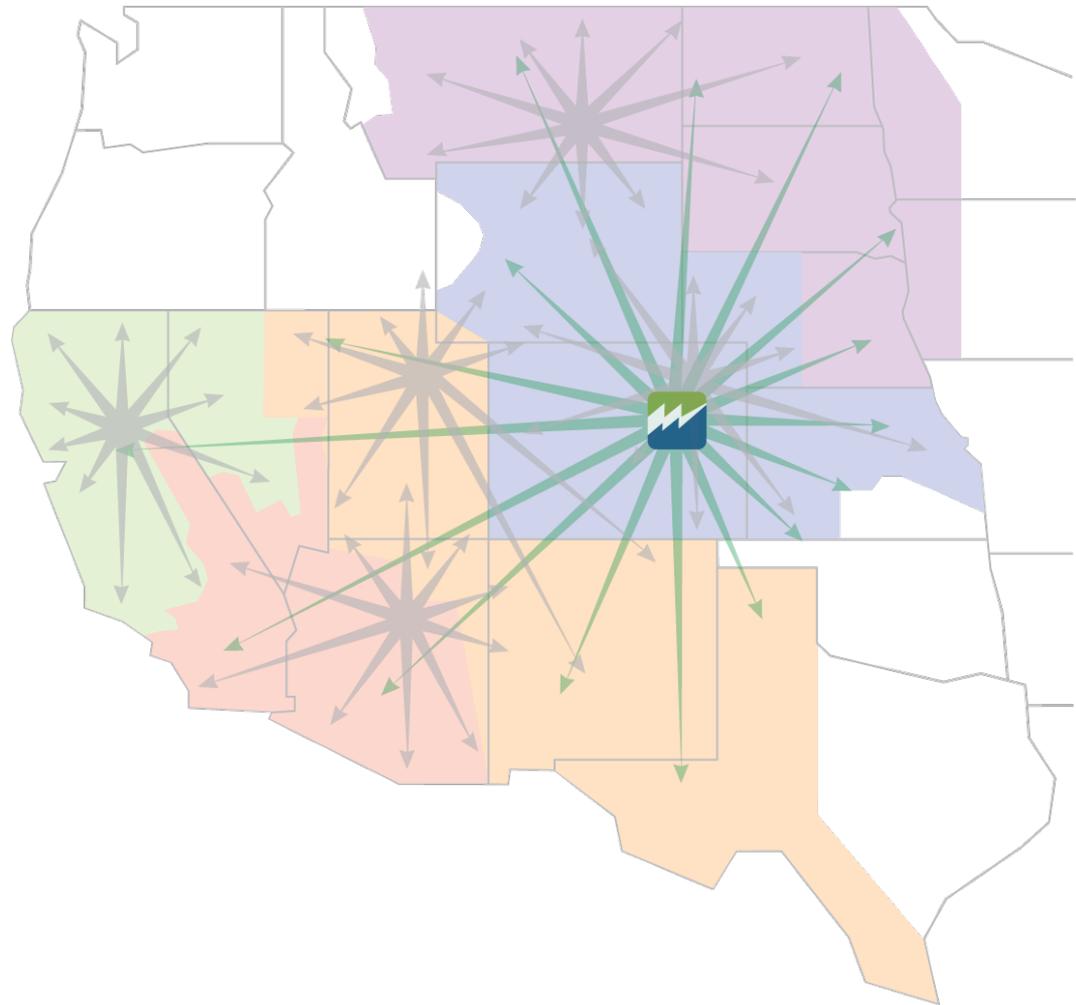


# WAPA's Three Lines of Business



# WAPA's distributed organization

- Distributed organization
- Multiple systems
- Competing demands

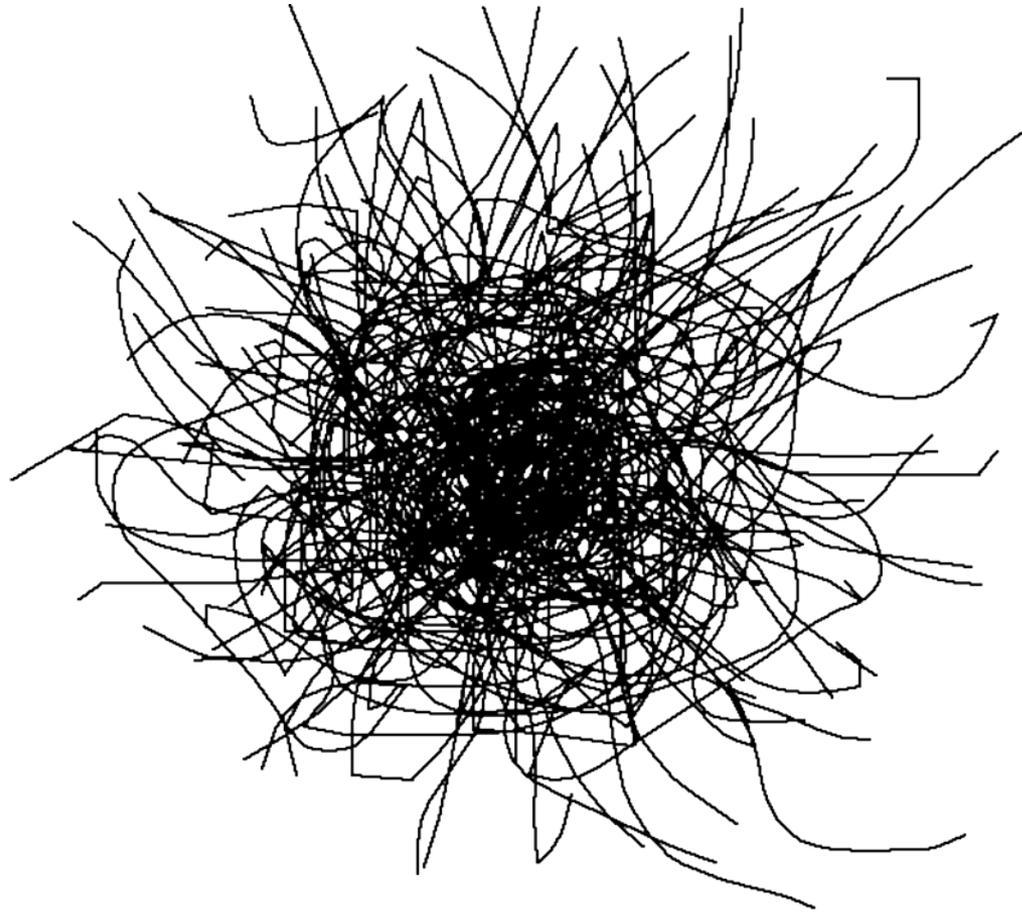


# My perspective

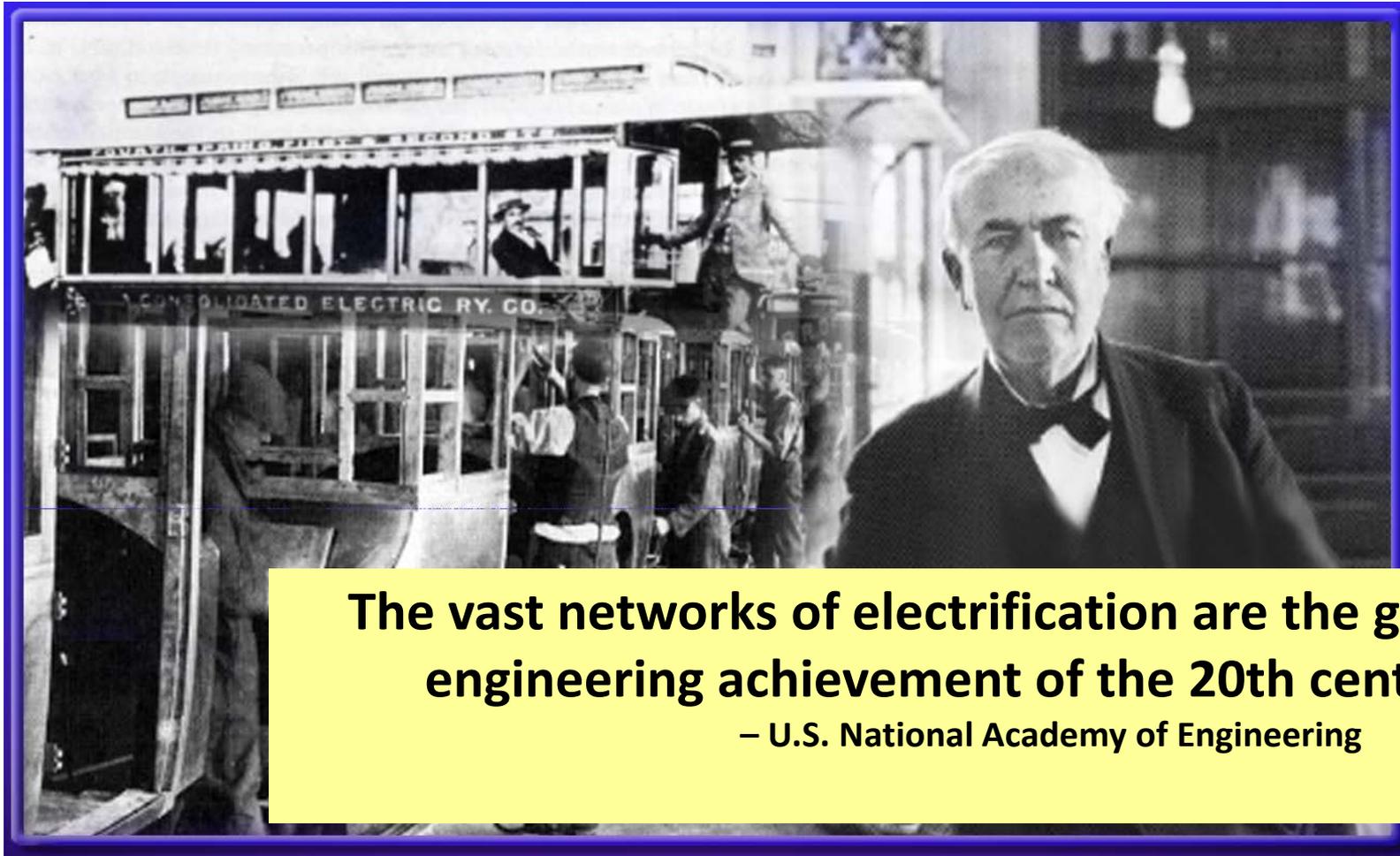
- 30 years in electric industry (plus gas, oil and water)
- Eight years at Electric Power Research Institute
- Certified technology nerd
- Utility, venture capital, private equity and consulting background
- A DOUG:
  - ✓ Dumb
  - ✓ Old
  - ✓ Utility
  - ✓ Guy



# Untangling the giant hairball of electricity



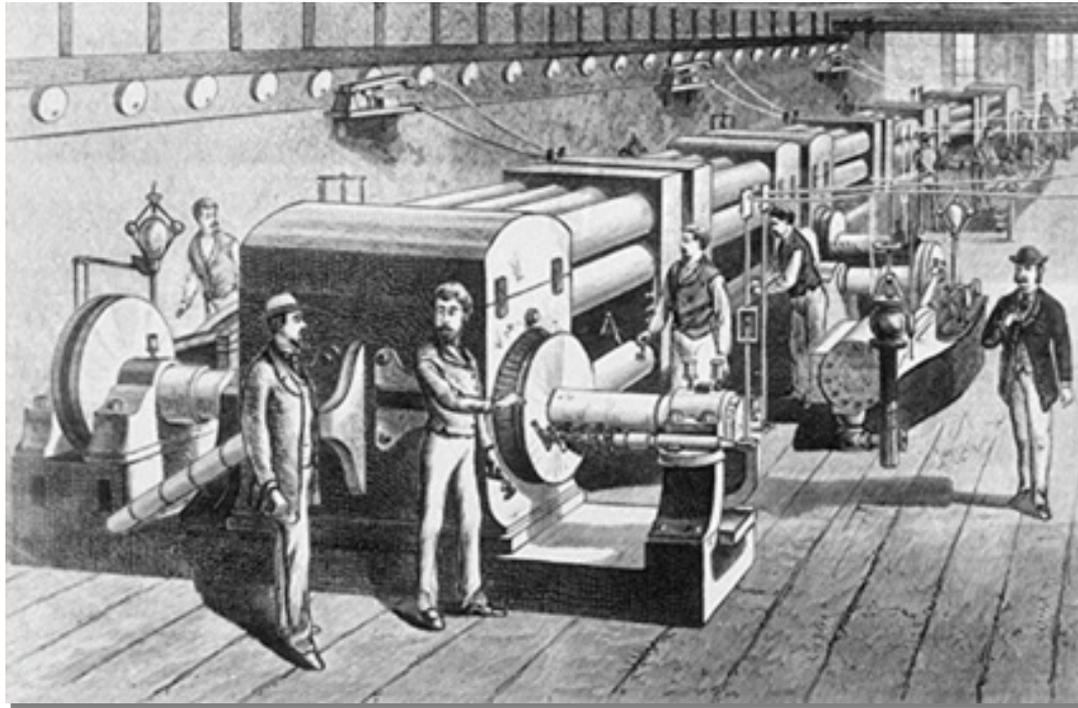
# Do you recognize this man?



**The vast networks of electrification are the greatest engineering achievement of the 20th century**  
– U.S. National Academy of Engineering



# Dot Com circa 1880: Electricity

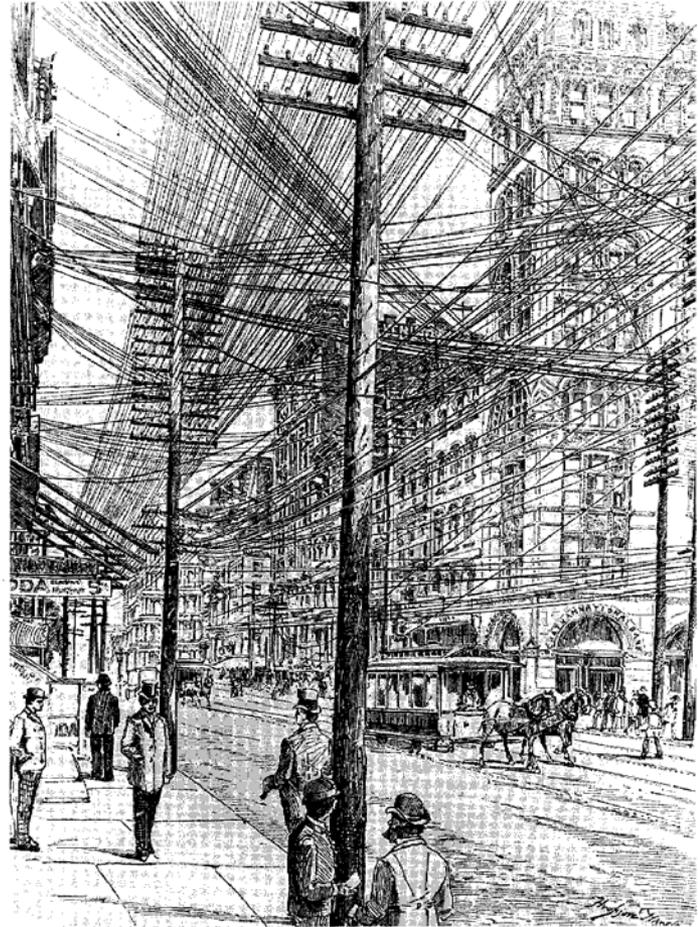


1882 First electric station built by  
Edison on Pearl Street



# Dot Com circa 1880: Electricity

- Industry began in support of other enterprises
  - Industrial
  - Telegraph, telephone
  - Street Cars
- Wild West of the east coast
  - 20 companies providing service in NYC
  - 18 deaths in 1889

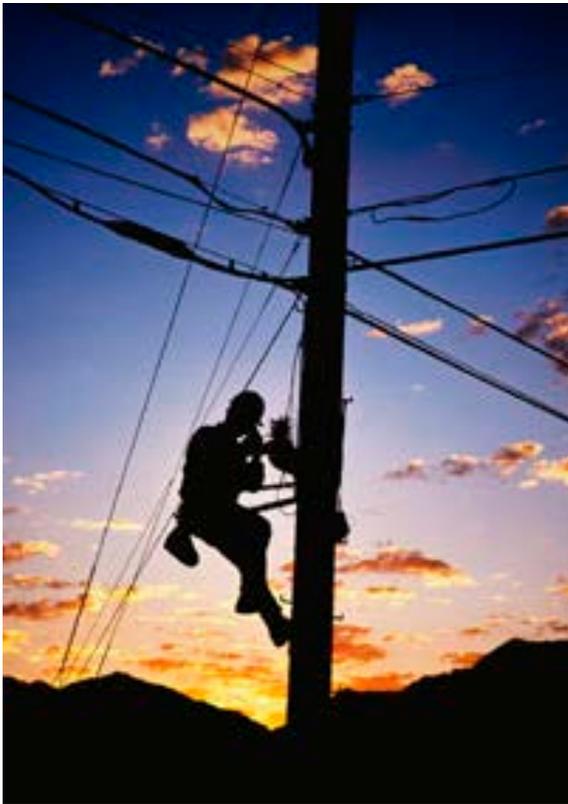


# Basic rules of electricity

- Electrons are governed by the laws of physics
  - Flows to the point of least resistance
  - Always must be in supply and demand balance
  - No storage outside of fossil fuel, water and some chemical reactions
- Electricity is governed by the laws of politics



# The U.S. power supply network is the largest most complex machine ever created



- Engages the most complex enterprise involving:
  - 5000 corporate entities
  - Several forms of ownership and levels of regulatory oversight
  - Some 100 million customers
- Attempts to satisfy conflicting economic, social political, and environmental objectives
- Complexity is increasing driving need for more system intelligence



# Challenges in the Energy Frontier



- Aging Infrastructure
- Increased regulation
- Intermittent resources
- Decreased hydro production
- More customer-side resources
- Changing markets
- Security



# Industry Changes



Who won the movie format battle:  
Betamax or VHS?



# Neither!

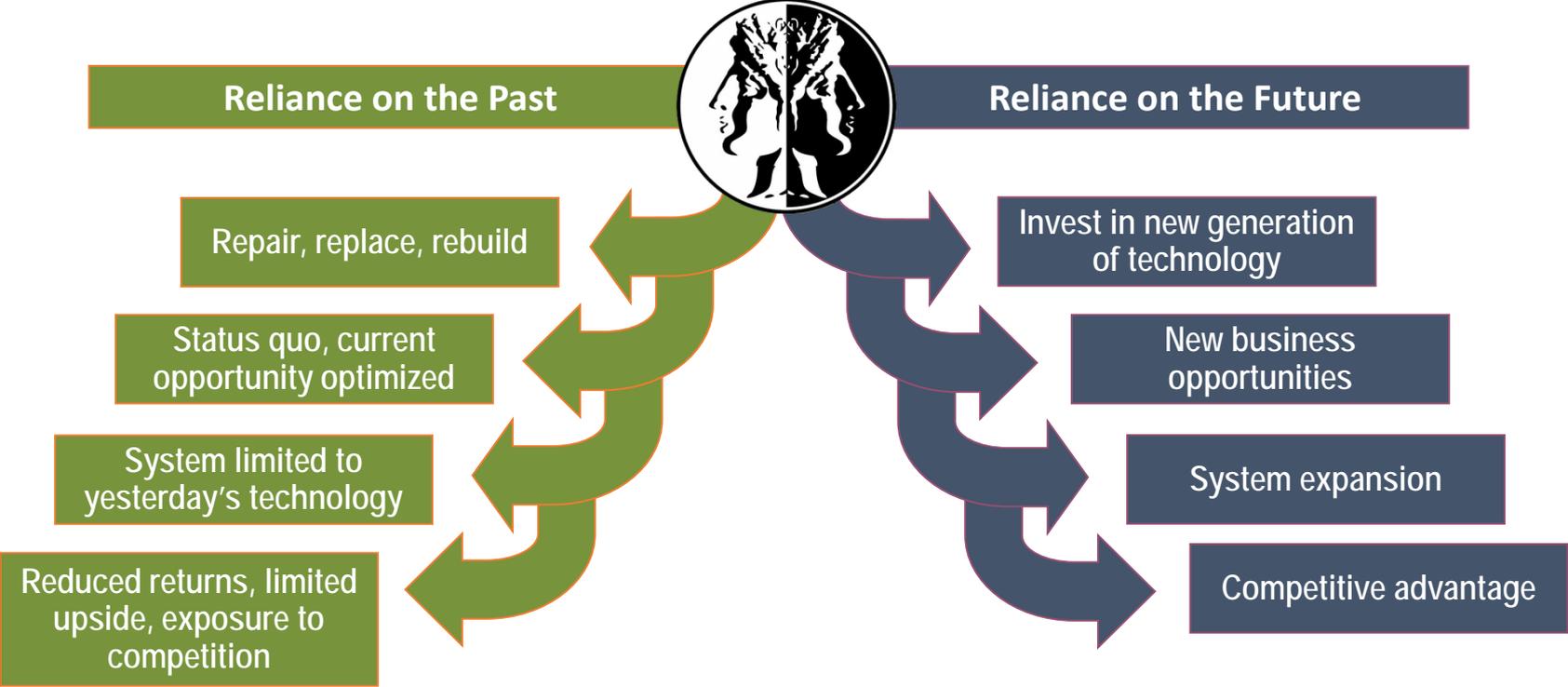


Apple redefined market:  
Identified megatrend:  
personalized entertainment



# The Janus Conundrum: *Looking Back or Looking Forward*

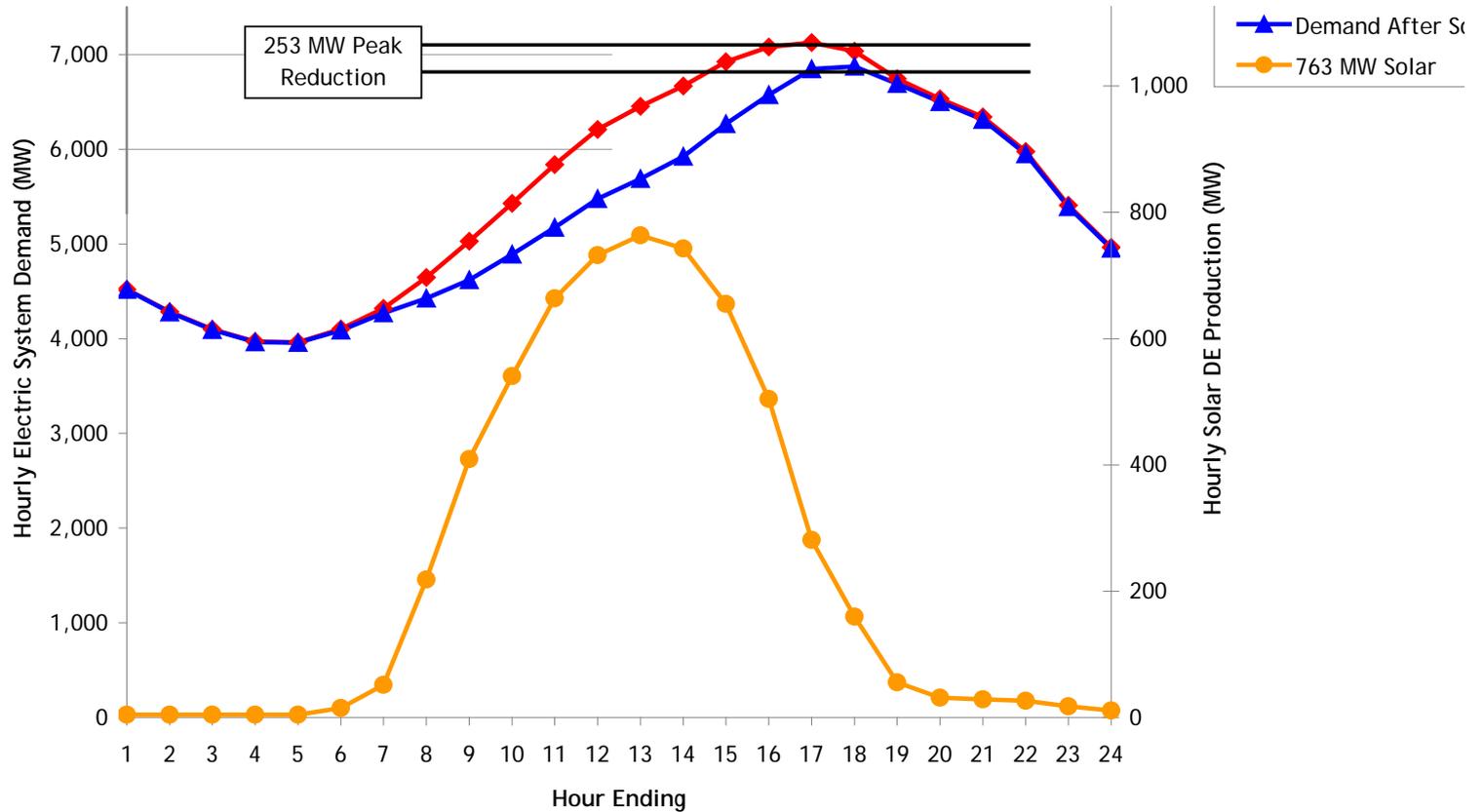
## Choice of Capital Investment



© Mark A. Gabriel, *Visions for a Sustainable Energy Future*



# The Solar/Peak Conundrum: Even in Arizona...



# MegaTrend: Carbon/Capacity Conflict

We're on track for the “t\*\*\*n w\*\*\*k” of regulations vs. carbon et al



# The Destiny of Carbon Constraints/ Capacity Conflict

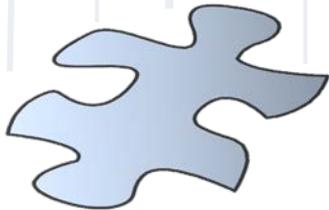


Developed world  
demand dead?  
Developing world  
demand galloping

- Demand for new power sources will outstrip capacity
- Demand for clean energy will outstrip the capacity
- Public perception contrasts with the reality of the system
- Renewables are being promoted the only answer
- Cost of renewables creates financial challenges



# Contrasting world views



- Reality of system operations is generally ignored
- Sky is falling?
- Sky is not falling?
- Reliability hangs in the balance
- Surge in demand, hot summer or cold winter may lead to significant shortages
- Timing of regulations impact different regions differently
- Belief, not engineering, leads the way



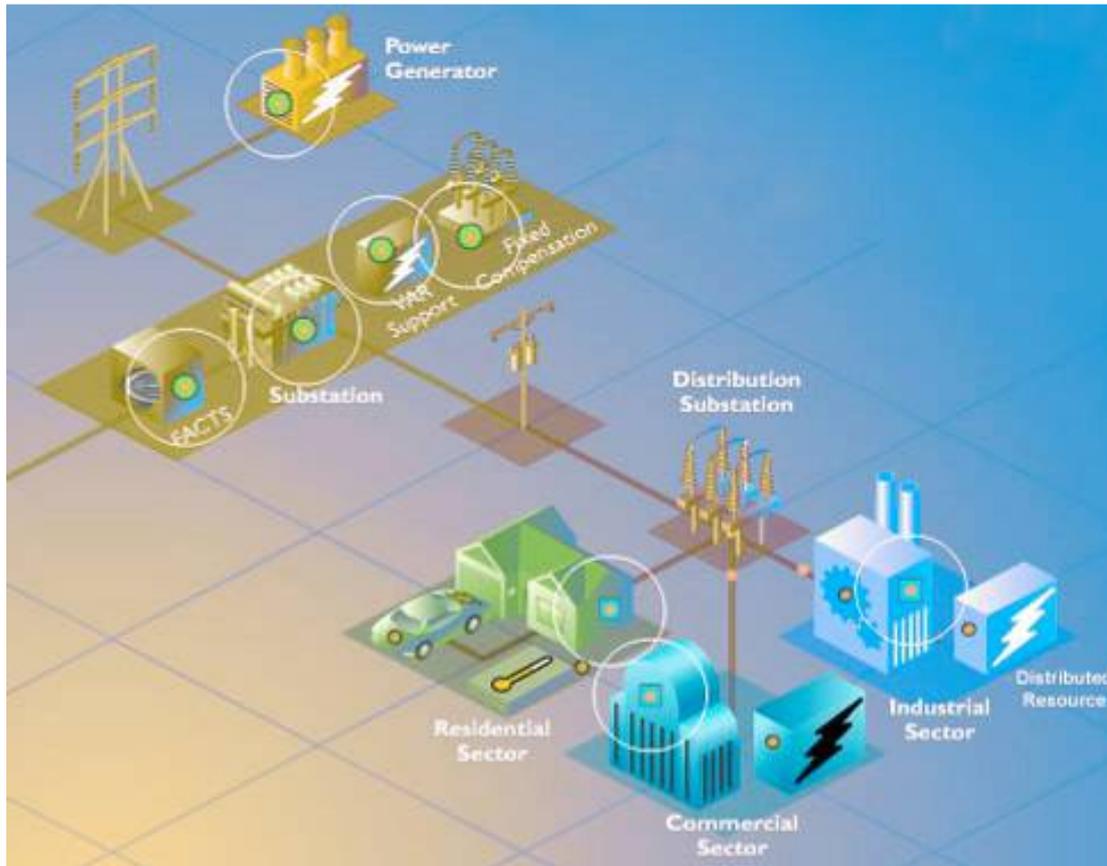
# The tug of war over what the new rules really mean



- Supreme Court stays Clean Power Plan
- NERC: EPA Rules Could Stress the Nation's Grid
- DOE: EPA rules will create no resource adequacy issues
- World Resources Institute: Cost predictions of EPA rules are overstated



# The Destiny of Intelligent Infrastructure



- \$50 Billion\* will be spent in next 5 years in T&D
- How SG will change load profile is critical
- The enabler for energy efficiency and demand response
- How customers interact with the system is key

○ Sensor    ● Sensor/Communications    ● Communications    ■ Customer Portal    ⚡ Generation

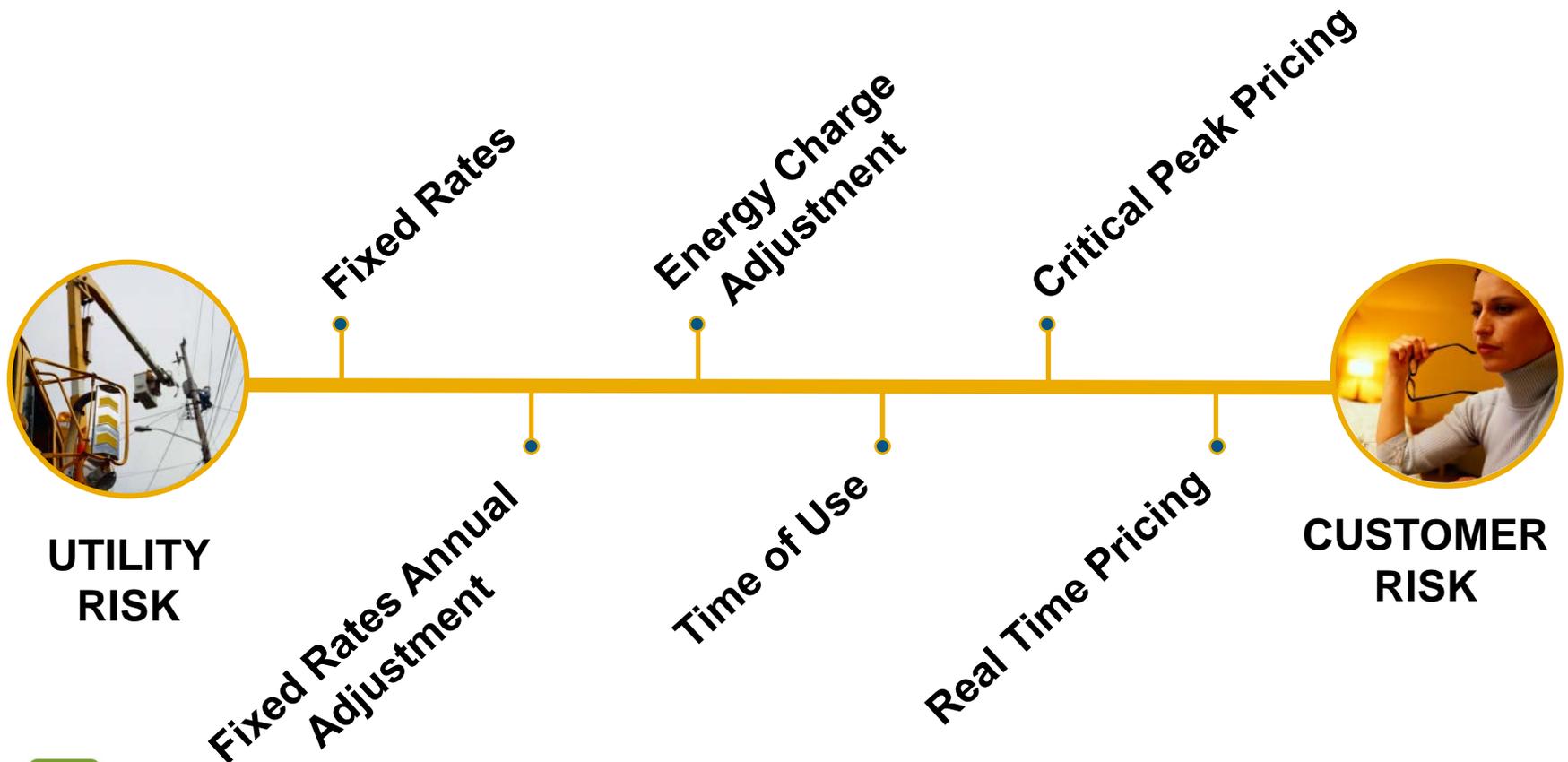


# My unpopular theory on smart grid

- 80% of the benefits of intelligent infrastructure will initially accrue to the utility
  - This is opposite of the majority of business cases
- Consumer participation will be initially low
  - This will change as automation takes hold
- Hype will hurt the efforts
  - We are building unrealistic expectations
- Utilities will move to smart grid because it makes sense
  - Workforce, environment and overheads will be the drivers
- Utilities will not get significant benefits unless they make major process changes



Customers want choice but not risk;  
customers do not necessarily make  
economic choices



# Home technologies will drive smart grid benefits

- As of December, 2015 there are 378 million wireless devices in the U.S. up from 285 million in 2009



# Water energy nexus

- Genesis Solar Project needs 536 million gallons of water every year
- Mojave Solar Project needs 705 million gallons per year



# Wildcards



## **ECONOMIC CONDITIONS**

Resurgence of economy increases demand at a time when coal plants are being shut down and/or retrofitted

## **NATURAL GAS**

Prices spike due to weather, increased industrial demand, pipeline congestion and/or other competing uses

## **WATER**

Regulations and aging infrastructure

## **POLITICS**



# 10 myths about energy

1. U.S. has a 3rd world Grid
2. Hydrogen is **the** answer
3. Electricity is expensive
4. Renewables and energy efficiency are **the** only answer
5. Natural gas is **the** answer to global warming
6. Demand has disappeared and will not return
7. The Dakotas/Nevada are **the** answer
8. PHEVs will make a difference in the next 10 years
9. The cap and trade bill will pass this year
10. Storage and advanced batteries are **the** answer



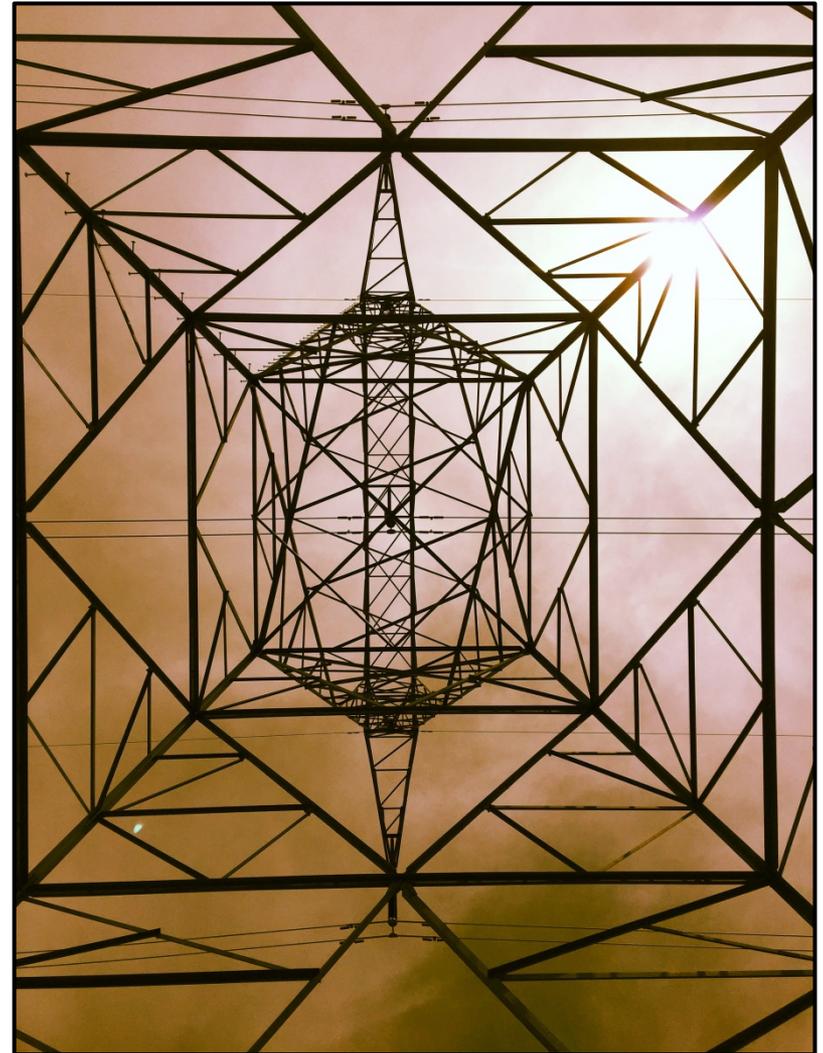
# 10 truths about energy

1. All the energy that there ever will be exists today
2. Demand is increasing across the globe
3. Technology will make a difference
4. Electric and gas rates will rise significantly
5. Transmission must be expanded
6. We need new base-load capacity
7. There will be generation shortages across the U.S.
8. Business will adapt to these new realities
9. Renewables create significant opportunities and challenges
10. The inconvenient truth: we need all forms of energy in the in the fuel mix



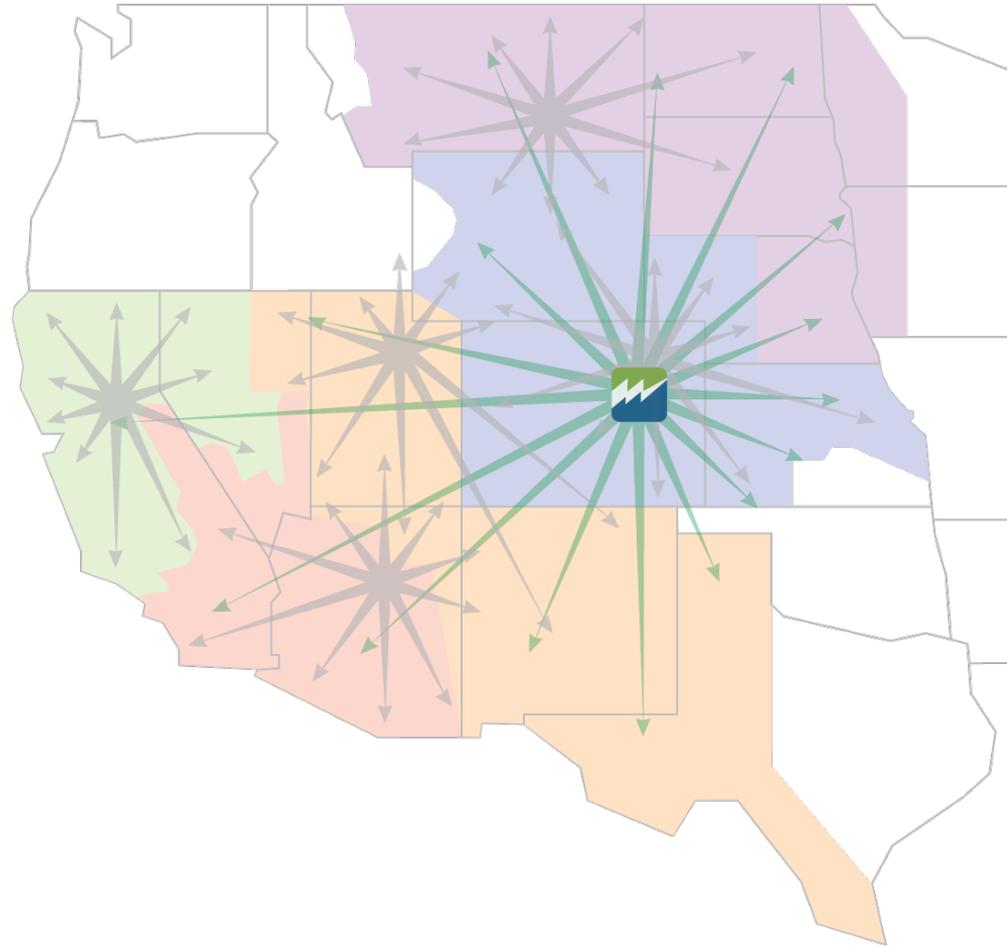
# WAPA's Interest

- WAPA's significant transmission system
  - More than 17,000 circuit miles
  - 15 states
  - Among top 10 in the country
- Expanding geographic scope of markets
- Expanding number of participants
- Increasingly limited trading partners



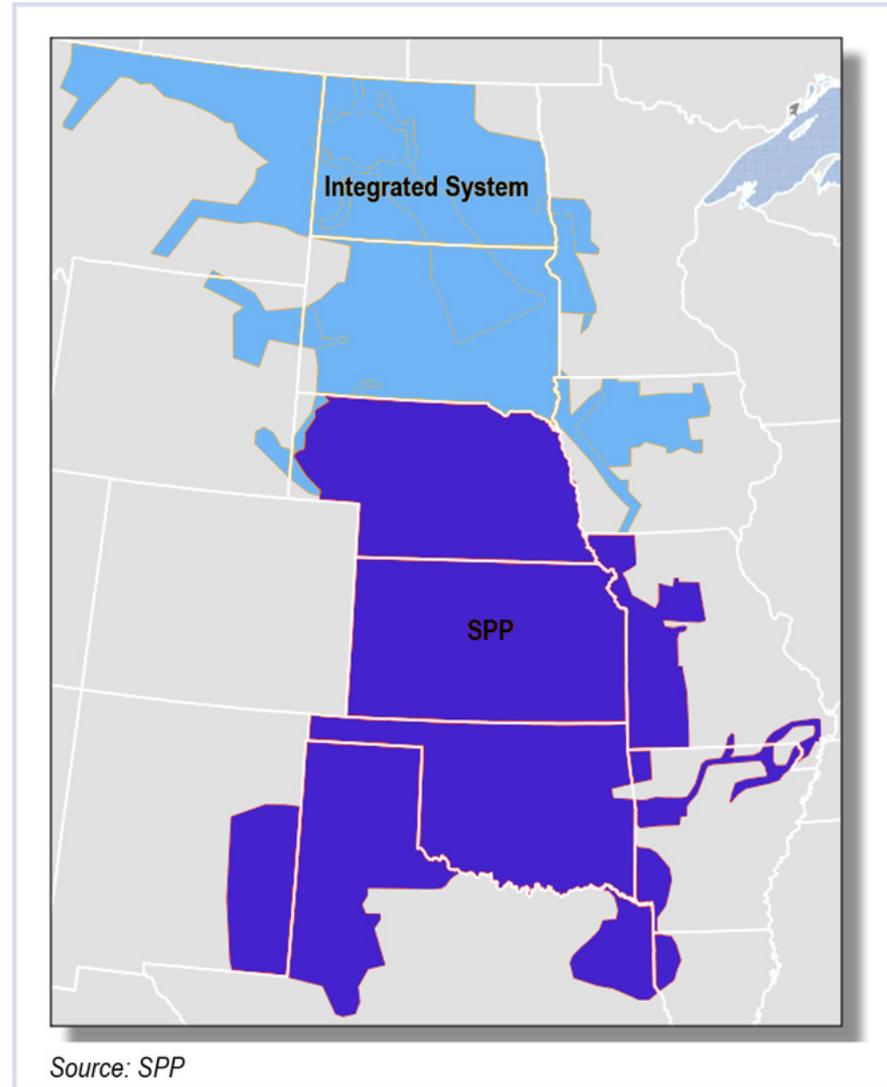
# WAPA's Concerns

- Statutory requirements
- Each region has unique legislation and needs that must be addressed on case-by-case basis
- Cost



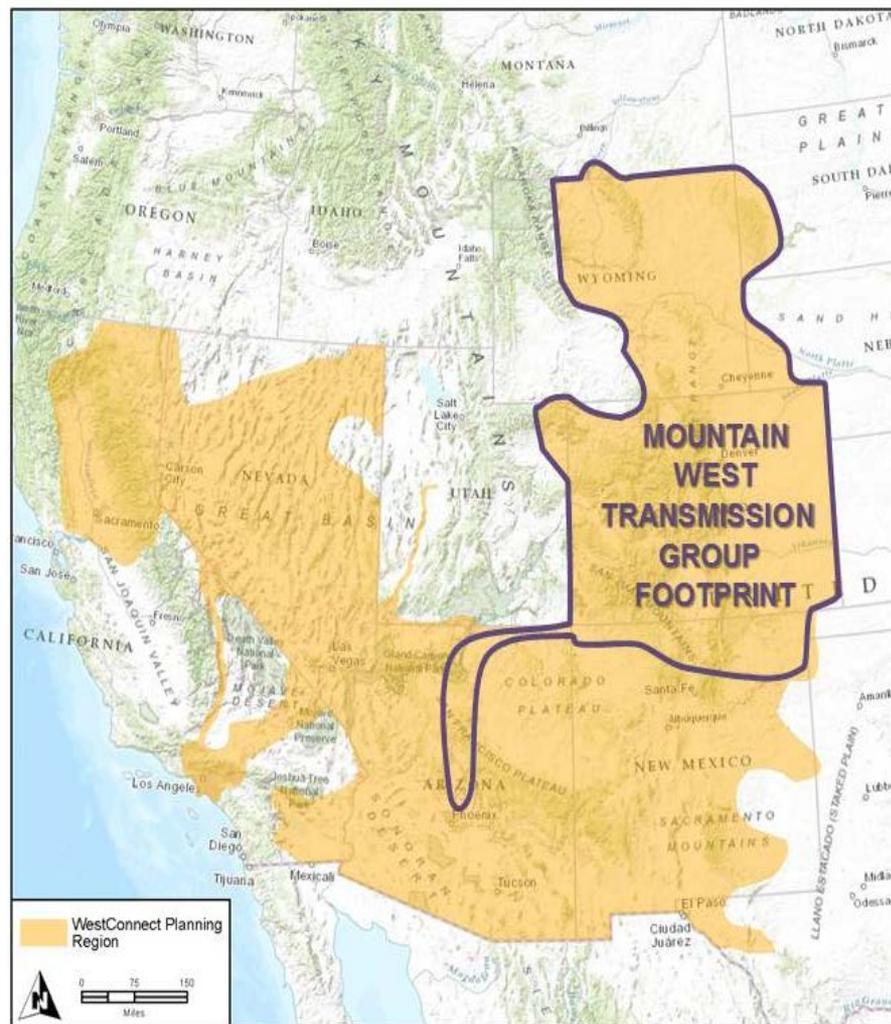
# Joining Southwest Power Pool

- Joined SPP October 1, 2015
- SPP provides greater flexibility  
Creates more options for buying and selling
- Reduces constraints in delivering power
- Helps keep costs low for customers
- Alternate Operations Study \$11.5 M net benefits predicted initial year savings/cost avoidance
- Savings estimated to be greater than the AOS



# MWTG

- Goal – Create a single multi-company transmission tariff and explore “Day 2” market alternatives
- MWTG TSPs include: two IOUs, two municipals; two REA G&Ts; two Federal PMA projects
- MWTG members are a sub-set of the WestConnect planning region members and are members of the Colorado Coordinated Planning Group (CCPG)
- Currently includes seven parties with nine transmission tariffs



# Key Take Away

*Each region has unique legislation and needs that must be addressed on case-by-case basis.*

*Customer engagement is critical.*



# Contact

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