Thank You AEPCO Members

- Class A Generation and Transmission Members
  - Graham County Electric
  - Duncan Valley Electric
  - Anza Electric
  - Sulphur Springs Valley Electric
  - Trico Electric
  - Mohave Electric

- Class D Energy Services Members
  - Central Arizona Water Conservation District
  - Valley Electric Association
  - Southwest Public Power Agency
  - Lincoln County Power District
  - Metropolitan Water District of Southern CA

- Customers
  - City of Safford
  - City of Thatcher
  - Town of Marana
  - Morenci Water & Electric
  - Avra Valley I&DD
  - Silverbell I&DD
Event Horizon Telescope (EHT)

• Silhouette of a black hole’s event horizon — the perimeter inside which nothing can be seen or escape — against its accretion disk. 54 M light years.
• Radio observatories across the globe working in tandem as one virtual Earth-sized radio dish with sharper vision than any single observatory could achieve on its own.
• Ingenuity – technical but bigger organizational challenge.
1960-1961 Idea Takes Shape

- Common Experience
- Rural Communities
- Democratic Model
- Strength of an idea and belief in success.
- Cooperative: not a partnership, its more than the sum of the parts.
RESOLVED, that the respective Wholesale Power Contracts between Arizona Electric Power Cooperative, Inc., and Sulphur Springs Valley Electric Cooperative, Inc., Duncan Valley Electric Cooperative, Graham County Electric Cooperative, Inc., and Trico Electric Cooperative, are hereby approved by the Board of Directors of the Arizona Electric Power Cooperative, Inc., and the president and secretary of Arizona Electric Power Cooperative, Inc., are hereby authorized to execute these contracts on behalf of the generating cooperative.

This motion carried unanimously.
1962 G&T Comes Together

- External Criticism
- Significant Debt
- Significant Risk
- Overcome with Cooperation
  - Mutual Trust
  - Collaboration
  - Fair Cost Allocation
  - Common Good
- Responsibility to each other, and those that came before
RESOLVED, that the Board of Directors hereby approves and authorizes its officers to execute the contract with the General Electric Company for purchase of the gas turbine package unit in the amount of $928,700.00 and the materialman’s contract with the General Electric Company for the related transformers, oil circuit reclosers, switches, and potential transformers, in the amount of $60,052.00.

This motion carried unanimously.
1965 Ground Breaking Benson
Apache Projects / Summer 2019

• ST2 Conversion / Regional Haze
• Low NOx / Reconstructed Burners
• Larger Gas Recirculation Fan
• Average energy cost very competitive

• 2 New deep Wells, refurbished 8 deep wells
• Conversion of 5 million gallon fuel tank to water storage
• 300 + ft. 8” Reclaimed ash piping
GT4 Turbine Replacement

- GT4 40 MW Aeroderivative Natural Gas Peaking Unit
- Compressor blades (defective coatings), bushings, high pressure turbine blade swap

GT3 Overhaul

- GT3 65 MW Combustion Turbine.
- Major overhaul (2019), compressor blades, turbine blades, combustion baskets, rotor rewind.
Pollution Control

- SNCR System
- ACI Injection / Testing New Product
- CaBr$_2$
- Chemical Costs (Urea / ACI) costs drop 13% in 2019
SO2 Reductions

MATS April 16, 2016
Regional Haze December 5, 2016

0.80 lbs/MMBtu
0.15 lbs/MMBtu

Actual Tons Emitted

2014 2015 2016 2017 2018
NOx Reductions

ST2/3 (gas): 0.20 lbs/MMBtu
ST2/3 (coal): 0.70 lbs/MMBtu

Regional Haze
December 5, 2017
ST2 (gas): 0.085 lbs/MMBtu
ST3 (SNCR): 0.23 lbs/MMBtu

ACTUAL TONS EMITTED

2014
2015
2016
2017
2018
Apache Air Permit Renewal

- Title V Air Operating Permit for Apache Generating Station was renewed for another 5 year period with no public comments filed, the renewed permit also closed out an outstanding Consent Order with ADEQ.
Sierra Southwest Cooperative Projects

Apache Solar
- 20MW PV
- Subscription Based
- Defective Fuses / Replaced

SunAnza
- 2 MW PV Phase I
- Phase 2 (2019-2020)
  - Additional PV
  - Battery Storage
  - Micro Grid
Wind Cost Competitive

Project Wind Energy Cost vs Market Energy Price Forecast ($/MWh)

- High-Bound Market Forecast
- Low Bound Market Forecast
- Typical New Mexico Wind Cost
Wind Complements Solar

Utility Scale Solar Vs. New Mexico Wind - Hourly Average Energy Production (% of Nameplate)

- Typical Utility Scale AZ Solar Output
- Typical NM Wind Output
Renewable Mandates / EPA

- Mandates
  - Proposition 127 (State 68% Fail / Service territories 80-89% Fail)
  - Nevada SB 358 (4-22-19) 50% by 2030
  - New Mexico SB 489 (3-22-19) 50% by 2030 / 80% by 2040
  - Colorado reduce carbon emission from 2005 levels by 80% by 2030, 100% 2050
  - ACC Competing Plans / Cooperative Flexibility

- EPA
  - From Clean Power Plan (CPP) to Affordable Clean Energy (ACE) Rule ACE, source-based approach to carbon standards that focuses on efficiency improvements at individual power plants. At OMB. Expected 6-30-19.
  - Coal Combustion Residual (CCR) Rule / DC Court Decision “Unlined” Impoundments.
Resource Planning

Short Term Operations and Market Engagement

We Study:
• How Can We Optimize Our Operations?
• How Do We Best Take Advantage of Low Gas Prices?
• How Should We Cover Our Summer Demand?

Renewable Resource Evaluation

We Study:
• Which Renewables Are Most Economical?
• How Can We Handle Intermittency?
• Will Storage Shift the Energy To When We Need It?

[Diagram showing Steam Unit 3 Dispatch and Delivered Gas]

[Graph comparing All-In Energy Production Costs of Natural Gas vs. Solar + Storage]
Transmission Projects

- Apache-Hayden Line Maintenance
- Valencia CAP Interconnection
- New 230 kV Transformer Greenlee Yard
2017
SCE 22 hour outage of Mountain Center for fire/high winds
100,016

2018
SCE 9+ day outage of Mountain Center for fire
764,540
Reliability Projects

• Joint projects utilizing expertise and resources efficiently to determine the most economical way to complete each project
• Mutual backup transmission service
• Radial transmission service replaced by looped transmission service
• Allow for normal and emergency maintenance without loss of load
• Reduces number of potential contingencies, thus reducing likelihood of loss of load
• Reduces level of exposure between protected transmission elements
• Increase load serving capability
Reliability Projects

- Hilltop Project Partner w/TEP
- Bagdad Project Partner w/APS
- Current and Future Reliability Projects
- Valencia and Rattlesnake Projects Partner w/CAWCD and WAPA
- Boothill Project Partner w/APS
- Fort Huachuca Project Partner w/TEP & Fort Huachuca
Operations Cost Tracking

3rd Party - AEPCO Comparison

- AEPCO (Rate Case Escalated)
- AEPCO (Cost-Cutting Measures)
- 3rd Party Proposal
- YTD Actual (March)

Yearly Costs:
- 2008: $3,843,500
- 2009: $2,967,000
- 2010: $2,778,600
- 2011: $2,655,800
- 2012: $2,904,976
- 2013: $2,834,100
- 2014: $2,916,216
- 2015: $2,887,383
- 2016: $4,552,745
- 2017: $3,465,000
- 2018: $2,655,800
- 2019: $2,904,976
- 2020: $2,916,216
- 2021: $2,887,383
- 2022: $819,655
- 2023: $0
- 2024: $1,000,000
- 2025: $2,000,000
- 2026: $3,000,000
- 2027: $4,000,000
- 2028: $5,000,000
- 2029: $6,000,000
- 2030: $7,000,000
- 2031: $8,000,000
- 2032: $9,000,000

Years:
- 2008
- 2009
- 2010
- 2011
- 2012
- 2013
- 2014
- 2015
- 2016
- 2017
- 2018
- 2019
- 2020
- 2021
- 2022
- 2023
- 2024
- 2025
- 2026
- 2027
- 2028
SCADA / EMS GE Upgrades

• SCADA / EMS upgrades, completed in 2018, have resulted in more integrated and efficient systems with sophisticated optionality.
  • Graphing and data displays are vastly improved, which make it easier to identify and resolve system problems.
  • A new state estimator program provides operators with real-time status reports on AEPCO’s system.

• Staff developed the custom programming needed to allow the Linux-based programs to interface with a Windows environment.

• The new system extends SCADA maintenance and support with GE and also upgrades the EMS to maintain compliance with the NERC CIP regulations, shielding control operations hardware and software from vulnerabilities.

• NRECA Close-up / GE’s Tech Advantage
Western Regional Trading Center

- Excess Sales $10,575,019 ($53/MWh Average)
- Purchases $12,000,542 ($25/MWh Average)
- 50% All ACES Transactions
- WRTC 2.0 Procedures / Errors
Energy Services Rates (% of 2010 Rate)
G&T Revenue per MWh Trend

*G&T Accounting and Finance Directory*
Compliance Update

• Findings of Potential Non Compliance (PNC)
  • 4 PNCs went to Compliance Exception
  • 5 PNCs Resulted in Find, Fix, Track (FFT)
  • Extensive Work on Mitigation Plans
  • FFT have zero dollar penalty amounts, Requires follow-up

• Compliance Initiatives Underway
  • Reorganization / SO, SME, Compliance Team
  • Modified Job Responsibilities
  • Executive Compliance Committee
  • Physical Security Controls
  • Cyber Security Tools (Substantial Software Upgrade)
Physical Security Controls

- Strengthening Security Posture at Apache
  - Fencing / Smart locks
  - Intrusion sensors at railroad access points
- Benson Security

- Increasing Physical Security at Substations
  - Key cards at station house
- Compliance with CIP Low Impact Requirements
  - New AEPCO physical security program
  - Effective January 1, 2020
Safety Trend

Number of Total Injuries

- Active Shooter Training
- Emergency Communication Protocol Upgrades
- OSHA Fall Protection Standard
- OSHA compliant with the new Silica Rule
- Joint Safety and Health Committee (Apache)
- Safety Action Team (Benson)
Thank You People of Arizona G&Ts / ACES