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June 2, 2016

Docket Control
Arizona Corporation Commission
1200 W. Washington Street
Phoenix, AZ 85007

RE: 2016 Biennial Transmission Assessment (BTA) Presentation
Docket No. E-00000D-15-0001

Attached please find a copy of Arizona Public Service Company's Ninth BTA Presentation from the June 1, 2016, Initial Workshop.

If you have any questions regarding this information, please contact me at (602) 250-3341.

Sincerely,

Kerri C

Kerri A. Carnes

KC/ks
cc: Thomas Broderick
Zach Branum
Kent Simer

Arizona Corporation Commission
DOCKETED
JUN 2 2016
DOCKETED BY

Commission Ordered Studies

Arizona Corporation Commission
2016 Biennial Transmission Assessment

Christopher M. Fecke-Stoudt, PE
Arizona Public Service
9th BTA Workshop #1
June 1, 2016

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Commission Ordered Studies

- Ten Year Snapshot (aka N-1-1 study)
  - Examines the adequacy of the Arizona transmission system without planned projects
- Arizona Extreme Contingency Study
  - Examines adequacy of the Arizona transmission system with long term outage of major transmission import points located in forested areas

Ten Year Snapshot
(aka N-1-1 Study)

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10 Year Snapshot Study Purpose

- Filed January 2016 by APS on behalf of SWAT
- Objective
  - Analyze how the ten year plans perform as a whole in a regional environment in the tenth year of the plan
  - Assess the affect of omitting individual planned transmission projects

10 Year Snapshot Study Base Case

- Starting Case
  - Heavy summer 2025
  - All proposed Initially Out of Service (IOS) facilities are modeled in the case and energized
  - Case recently approved by WECC, so used "off the shelf"
  - Minor refinements to shunt caps and generation selection

10 Year Snapshot Study Coordination

- TEP/UNSE and AEPCO indicated no project for Ten Year Snapshot evaluation
- Coordinated study with SRP, but each individually performed IOS analysis
- Coordination and approval of study plan and with SWAT-AZ
- Shared preliminary results with SWAT-AZ
- Approval of final report with SWAT-AZ

APS IOS Cases

Case Code	Planned Project modeled as initially out of service for N-1-1 analysis • Bullet items are facilities identified for removal for the project	In service Date
APS01	North Gila – Orchard (TS8) 230kV line • North Gila – Orchard 230kV line • North Gila 500/230 kV transformer	2021
APS02	Morgan – Sun Valley 500kV line • Morgan – Sun Valley 500 kV line • Sun Valley – Hassayampa Pump 230 kV line	2018

Ten Year Snapshot Study
SRP IOS Cases

Case Code	Planned Project modeled as initially out of service for N-1-1 analysis • Bullet items are facilities identified for removal for the project	In service Date
SRP01	RS-28 230/69kV Substation and RS-28 – Schrader 230kV line • RS-28 230/69kV Substation • RS-28 – Schrader 230kV Line	2018
SRP02	Browning – Corbell 230kV and Santan – Rogers 230kV line reconfiguration • Browning – Corbell 230kV line • Santan – Rogers 230kV Line • (Browning – Rogers 230kV Line put back in service)	2020

What is an IOS Case?

- IOS case = base case minus a planned facility (or project)
- Example: APS Case Sun Valley – Morgan 500 kV Project (2018)
  - Started with the Final 2025 case
  - Changed the status to "off" for
    - Sun Valley – Morgan 500 kV line
    - Sun Valley – Hassayampa Pump 230 kV line
  - Solved & saved the IOS and readjusted the system, if needed
  - Ran same contingency list as with base case

Monitoring Criteria

Outage Type		Thermal Criteria	Voltage Criteria
N-0	No outage, all lines in service	No element exceeding 100% of its normal rating	Less than 0.95 or greater than 1.05 of nominal voltage
N-1	Single element outage	No element exceeding 100% of its emergency rating	No voltage deviation greater than 8%
Project Outage (N-1-1)	Project outage (with system adjustments) followed by another contingency	Reducing loadings to 100% (or less) of normal rating following the removal of a project and 100% or less of the emergency rating for the subsequent outage	No voltage deviation greater than 8%

- All Arizona elements 115 kV and above monitored

Base Case Results Summary

- Prior to any outages (N-0 conditions) low voltages at PD-Morenci 230 kV
- Contingencies studied included Arizona transmission lines and transformers with voltages greater than or equal to or 115kV
- Single contingency (N-1)
  - Saguaro East – Marana and Three Points – Sandario 115kV lines overloaded for several outages
  - No solve for Marana – Saguaro 115 kV (Breaker to Breaker) outage
  - Notified impacted utilities
  - These overloads and no-solves are currently being investigated and mitigations, if required, will be incorporated into future 10 year plans. One possible mitigation is the ED-5 – Saguaro – Marana 115 kV bypass of Saguaro to become ED-5 – Marana 115 kV. (Western has implemented this project)

IOS Results Summary

- No additional violations or concerns identified in IOS cases (compared to the base case results)
  - All thermal overloads pre-existing in base case
  - No-solve remained from base case
  - All voltage/voltage deviations pre-existing in base case

Summary of Findings

- This study indicated the planned 2025 Arizona transmission system is robust, as shown by the few instances of localized voltage and thermal violations in the base case.
- APS project outage scenarios indicated that a delay of any one project did not have a significant negative impact on the remaining transmission system.
- Delay of projects investigated in this study beyond their in-service dates may not impact the Arizona BES transmission system, but it could have impacts on underlying local load-serving facilities

Arizona Extreme Contingency Study

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AZ Extreme Contingency Study

- Filed under a NDA with the ACC
- CEII information
- High level summary of study results

Extreme Contingency Study Coordination

- Coordination and approval of study plan and with SWAT-AZ
- Shared preliminary results with SWAT-AZ

Study Assumptions

- Utilize the 2016 and 2024 heavy summer power flow cases
- The integrated Arizona power system is represented
- Corridors are chosen based upon exposure to forest fires and other extreme events
- A bank of 500/230 kV transformers at one substation

Summary of Results (2016 and 2024)

- For all outages studied, all load can be served & local Phoenix reserve requirements met
  - Some outages from remote generation would require redispatching from other available sources
    - Maximum redispatch requirement is @ Cholla/Coronado
    - Generation made up or purchased from available AZ and CA units
  - Some outages would require some system reconfiguration to alleviate overloads

Questions?

Contact
Arizona Public Service
Christopher.FeckeStoudt@aps.com

APS Ten-Year Transmission Plan 2016-2025

Arizona Corporation Commission
2016 Biennial Transmission Assessment

Jason Spitzkoff
Arizona Public Service
9th BTA Workshop #1
June 1, 2016

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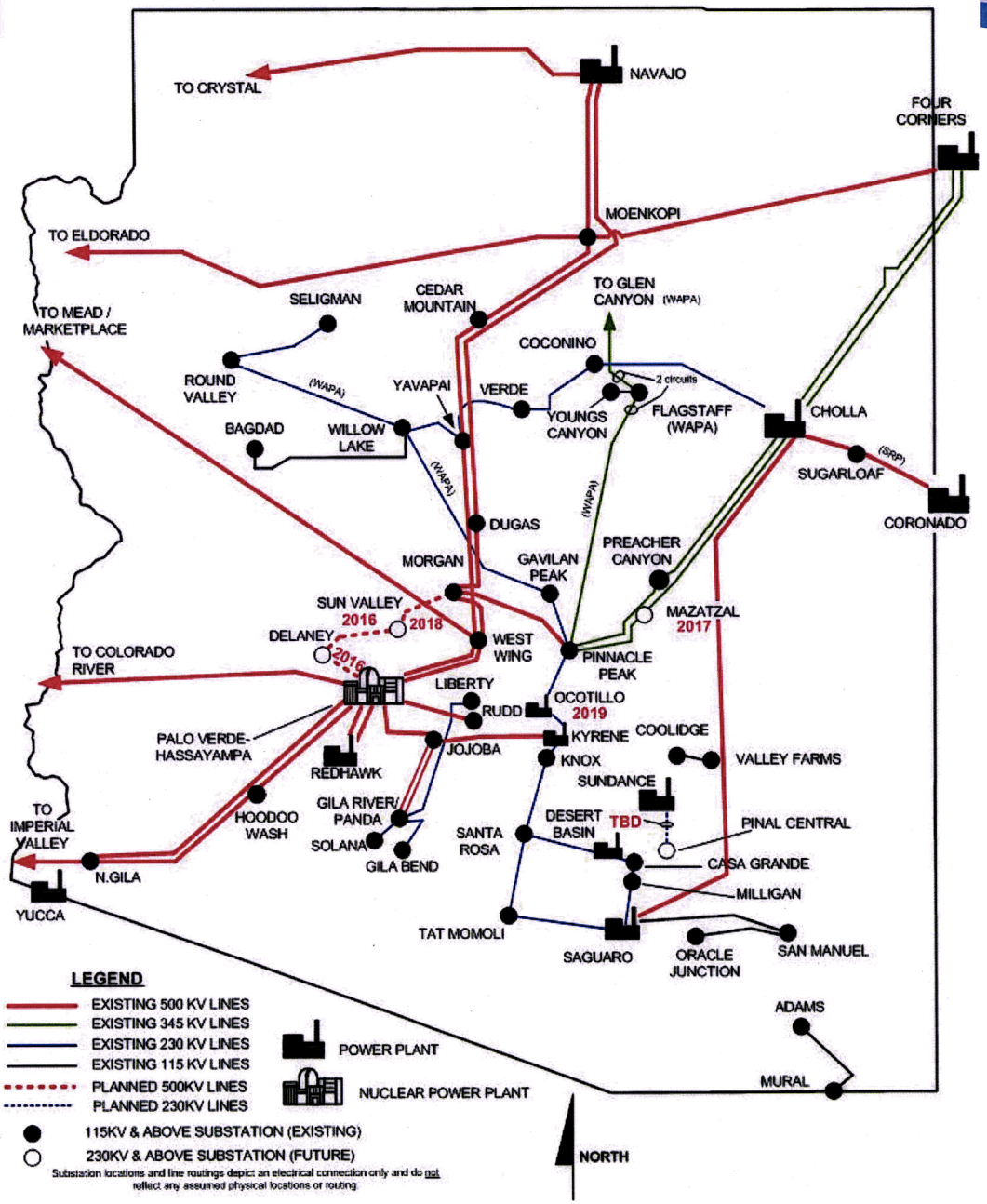
Agenda

1. Review APS's filed 2016-2025 Transmission Plan

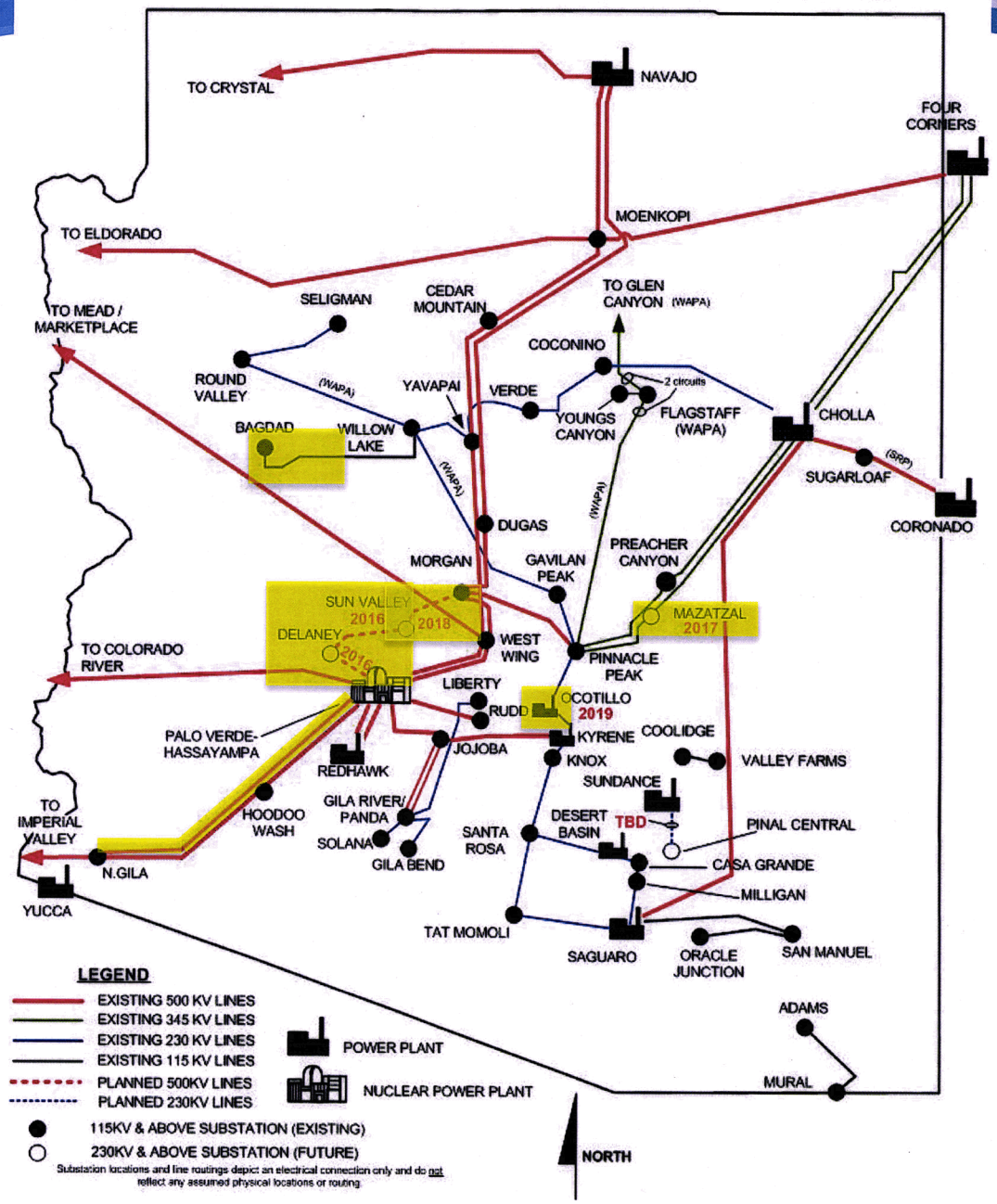
2. Highlight changes since 8th BTA

3. Responses to preliminary questions

APS EHV & OUTER DIVISION 115/230 KV TRANSMISSION PLANS 2016 – 2025



APS EHV & OUTER DIVISION 115/230 KV TRANSMISSION PLANS 2016 – 2025



In-Service:

- Hassayampa-North Gila 500kV #2 Line
- Bagdad 115kV Line Relocation

2016: Energized 5/23

- Delaney-Palo Verde 500kV Line
- Delaney-Sun Valley 500kV Line

2017:

- Mazatzal 345/69kV Substation

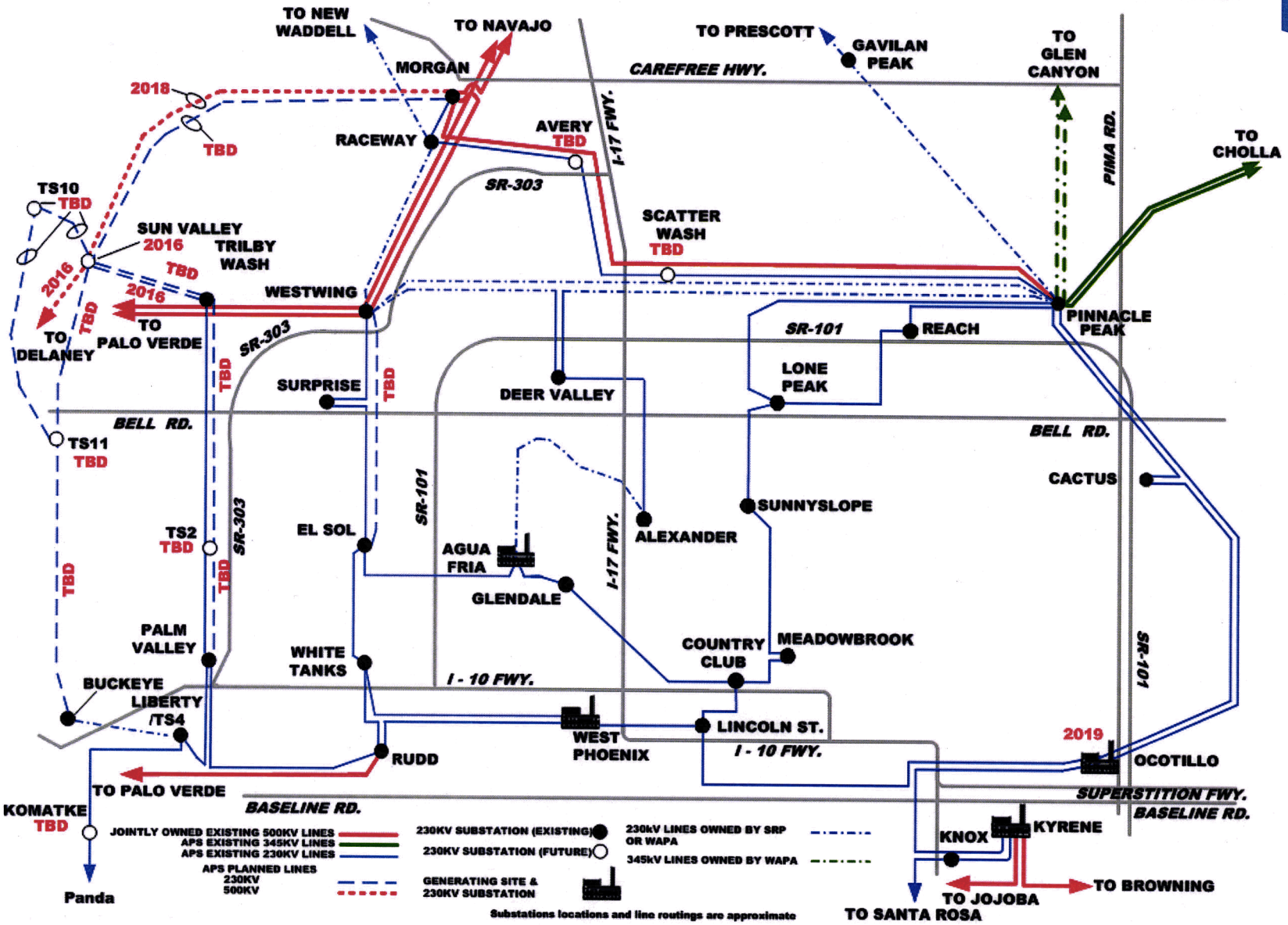
2018:

- Morgan-Sun Valley 500kV Line

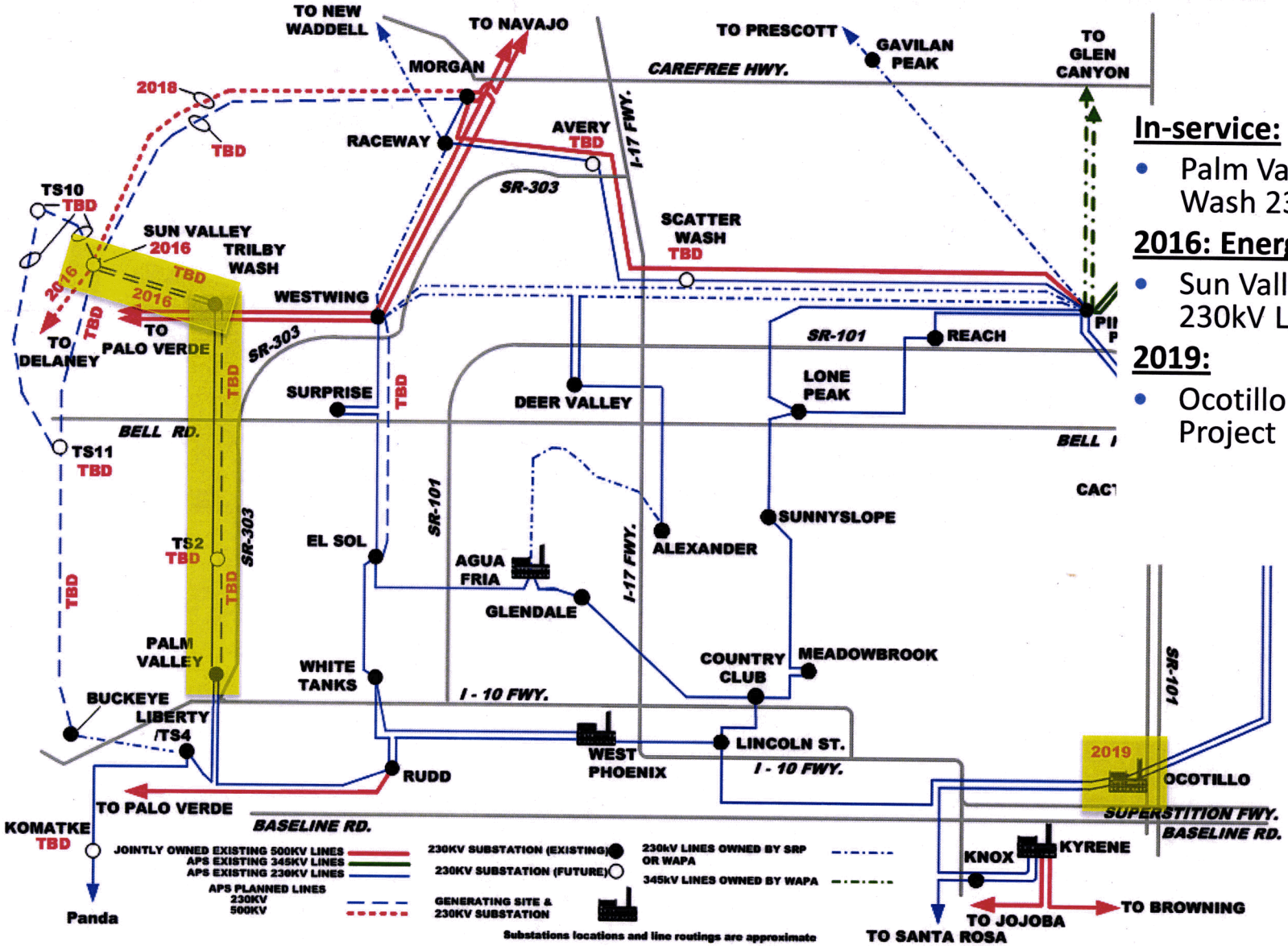
2019:

- Ocotillo Modernization Project

PHOENIX METROPOLITAN AREA TRANSMISSION PLANS 2016-2025



PHOENIX METROPOLITAN AREA TRANSMISSION PLANS 2016-2025



In-service:

- Palm Valley-Trilby Wash 230kV Line

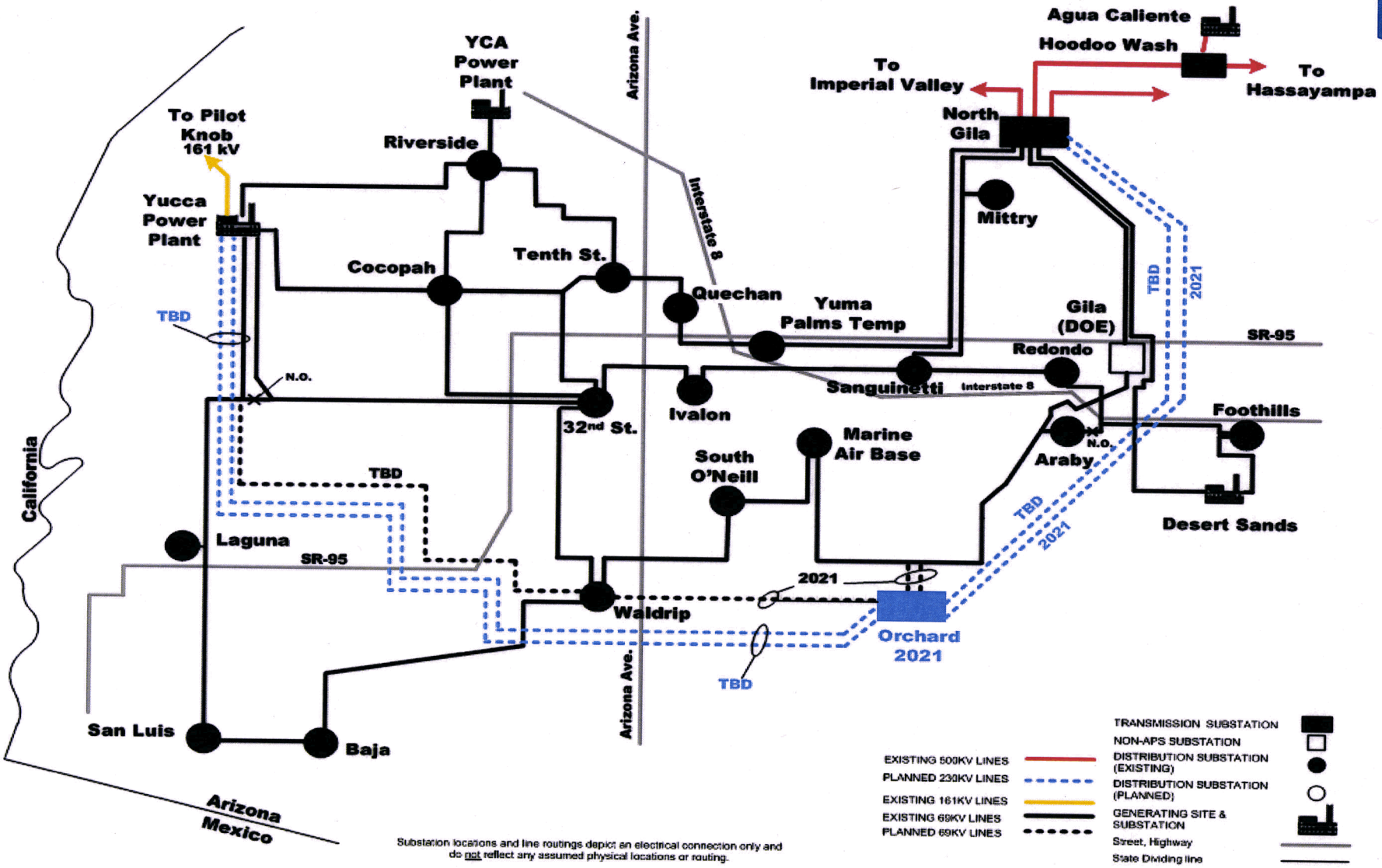
2016: Energized 5/23

- Sun Valley-Trilby Wash 230kV Line

2019:

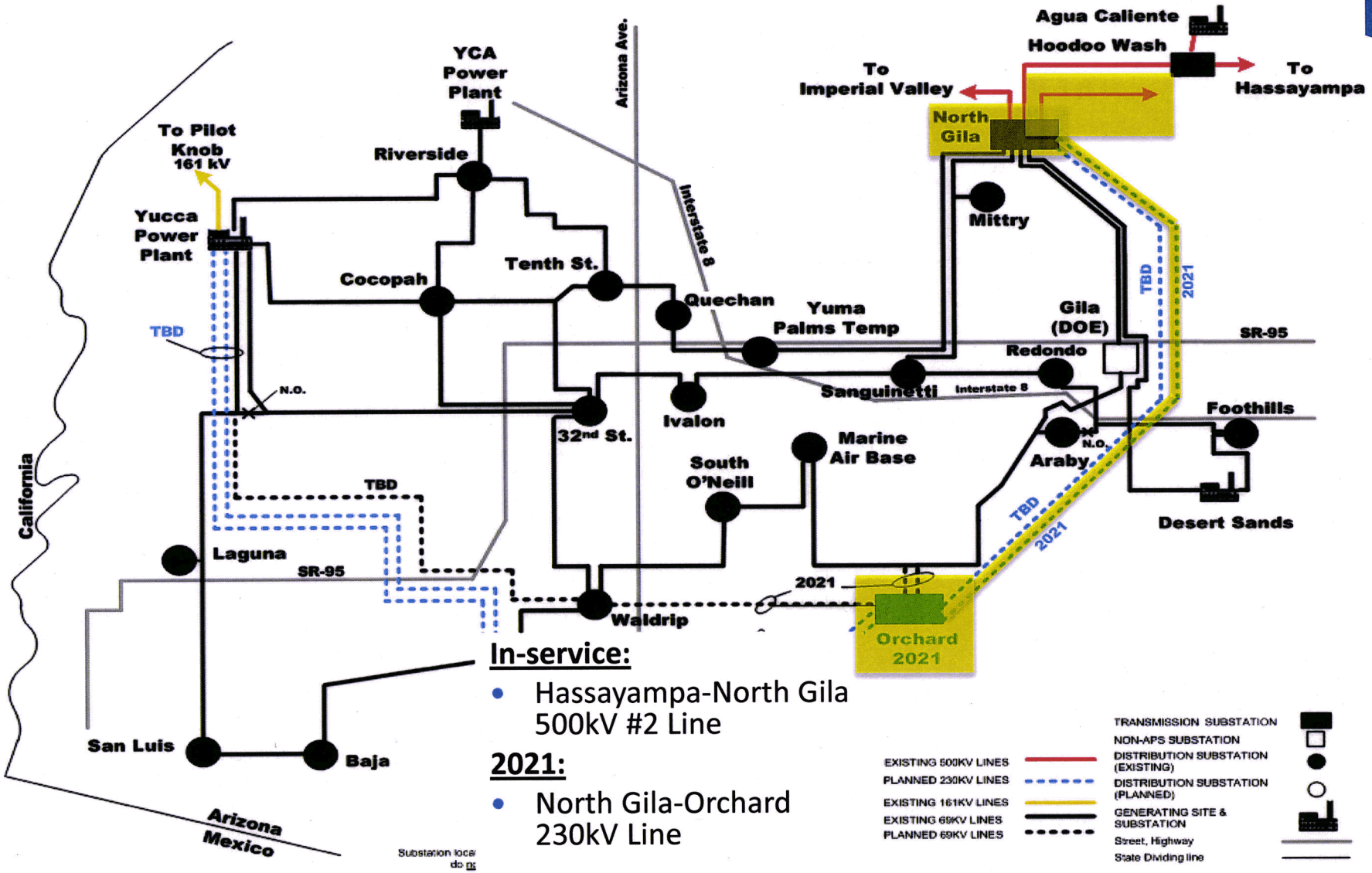
- Ocotillo Modernization Project

Yuma Area Transmission Plans 2016-2025



Substation locations and line routings depict an electrical connection only and do not reflect any assumed physical locations or routing.

Yuma Area Transmission Plans 2016-2025



In-service:

- Hassayampa-North Gila 500kV #2 Line

2021:

- North Gila-Orchard 230kV Line

Equipment Additions / Replacements

Description	Year
Two 100MVAR Reactors at Four Corners 230kV (in-service)	2015
Trilby Wash 230/69kV Transformer (in-service)	2015
Sun Valley 500/230kV Transformer (in-service)	2016
Delaney 500/69kV Transformer (in-service)	2016
Mazatzal 345/69kV Transformer	2017
Four Corners 500/345kV Transformer	2017
North Gila 500/230kV Transformer	2021
Orchard 230/69kV Transformer	2021
Orchard 230/69kV Transformer #2	2021
Saguaro 230/69kV Transformer	2021
Prescott 230/115kV Transformer #3	TBD

Changes since 8th BTA

- Six projects completed
  - Palm Valley-Trilby Wash 230kV line – Energized 4/2015
  - Hassayampa-North Gila #2 500kV line – Energized 5/2015
  - Bagdad 115kV Relocation – Energized 9/2015
  - Four Corners 230kV reactors – Energized 12/2015
  - Palo Verde-Delaney-Sun Valley 500kV – Energized 5/2016
  - Sun Valley-Trilby Wash 230kV – Energized 5/2016
- Actively under construction
  - Mazatzal 345/69kV substation

Changes since 8th BTA (con't)

- Project changes
  - Ocotillo Modernization Project in-service pushed back from 2018 to 2019
  - North Gila-Orchard 230kV line in-service pushed back from 2018 to 2021
  - Scatter Wash substation in-service changed from 2021 to TBD
  - Jojoba 230/69kV substation name changed to Komatke
- New Additions/Replacements
  - Delaney 500/69 transformer: Energized 5/23/16
  - Four Corners 500/345kV transformer #2

Sub regional & Stakeholders

- APS projects are modeled in all WECC cases
- APS/SRP Joint Stakeholder meetings (FERC Order 890)
  - 6/18/2015 and 12/15/2015
- APS's projects are included in Southwest Area Transmission (SWAT), WestConnect, and Transmission Expansion Planning Policy Committee (TEPPC) plans
- Projects included in WestConnect Regional Model and WestConnect Regional Planning

WECC Path Rating

- APS planning to add a second 500/345kV transformer at Four Corners
- Currently being studied and will be reviewed by Four Corners Technical Task Force as the Project Review Group (PRG)
- After PRG review and acceptance it will be submitted to WECC and will request expedited path rating

Coal Retirements

- APS has not identified any specific transmission projects at this time directly related to actual, planned, or potential coal retirements.
- The system functions as part of a larger portfolio which is continuously evaluated based on a number of factors including resource requirements and the location of existing and new generating units.
- Evaluations are on-going as part of the IRP and BTA processes

Neighboring States' Renewable Portfolio Standards

- WestConnect planning study included Public Policy Needs Assessment
- Load and resource plans for neighboring systems included in WECC cases
- Regional transmission projects included in system models when warranted
- Multiple Transmission Service Requests into Four Corners in order to deliver power to the west

Questions ?

Contact:

Arizona Public Service

Jason.Spitzkoff@aps.com

Distributed Generation and Energy Efficiency Study

Decision No. 74785

Arizona Corporation Commission
2016 Biennial Transmission Assessment

Jason Spitzkoff
Arizona Public Service
9th BTA Workshop #1
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DG & EE Study

- 8th BTA ordered utilities with retail load to perform a study
  - Disaggregate effects of DG & EE from load
  - In 5th planning year determine effects of DG & EE on future planned transmission system
    - How would your plan change if there was no additional DG and EE over the next 5 years

DG & EE Study

- Two scenarios were studied
  - Base scenario is traditional planning load
    - DG/EE forecasts netted out of load
  - DG/EE scenario is responding to 8th BTA decision
    - DG/EE forecasts for next 5 years added back into load
  - DG/EE values assumed all in metro Phoenix load pocket

Case	Scenario	Load	EE	DG
1	Base	Peak	On	On
2	EE/DG	Peak	Pre 2016 only	Pre 2016 only

APS DG and EE Impact

- EE was the primary contributor to the impacts found in the Study.
  - The 703 MW difference is comprised of 79% EE and 21% DG.

Case	Scenario	Load (MW)	EE (MW)	DG (MW)	Total APS Load (MW)
1	Base	8064	-558	-145	7361
2	DG/EE	8064	0	0	8064

APS's DG and EE Conclusion

- APS's Transmission Plans for 2020 would not change if DG/EE growth did NOT occur as forecasted between 2016-2020.
- Potential impact on Subtransmission Planning if DG/EE growth did NOT occur as forecasted between 2016-2020.
  - Impact was seen on 230/69kV transformers
  - Advancement of the in-service date for one 230/69kV substation could be needed.
  - Specific need date and final determination of need is dependent upon actual location of where DG/EE effects are modeled.

Questions?

- Contact Jason Spitzkoff
  Jason.Spitzkoff@aps.com