Arizona Renewable Transmission Task Force BTA Response

Chairman of SWAT RTTF
Peter Krzykos

BTA Workshop
May 22-23 2008

BTA Order

"IT IS FURTHER ORDERED that in the next BTA, Commission regulated electric utilities, in consultation with the stakeholders, should prepare an assessment of ATC for renewable energy and prepare a plan, including a description of the location, amount and transmission needs of renewable resources in Arizona, to bring available renewable resources to load."

SWAT RTTF Phase #1
Integration of Renewable Resources into Arizona Transmission Network
BTA Response

- Three Parts to the BTA Response
  - Assessment of ATC in Arizona
  - Potential renewable resources in Arizona
  - Potential transmission configuration to deliver the renewable resources in Arizona

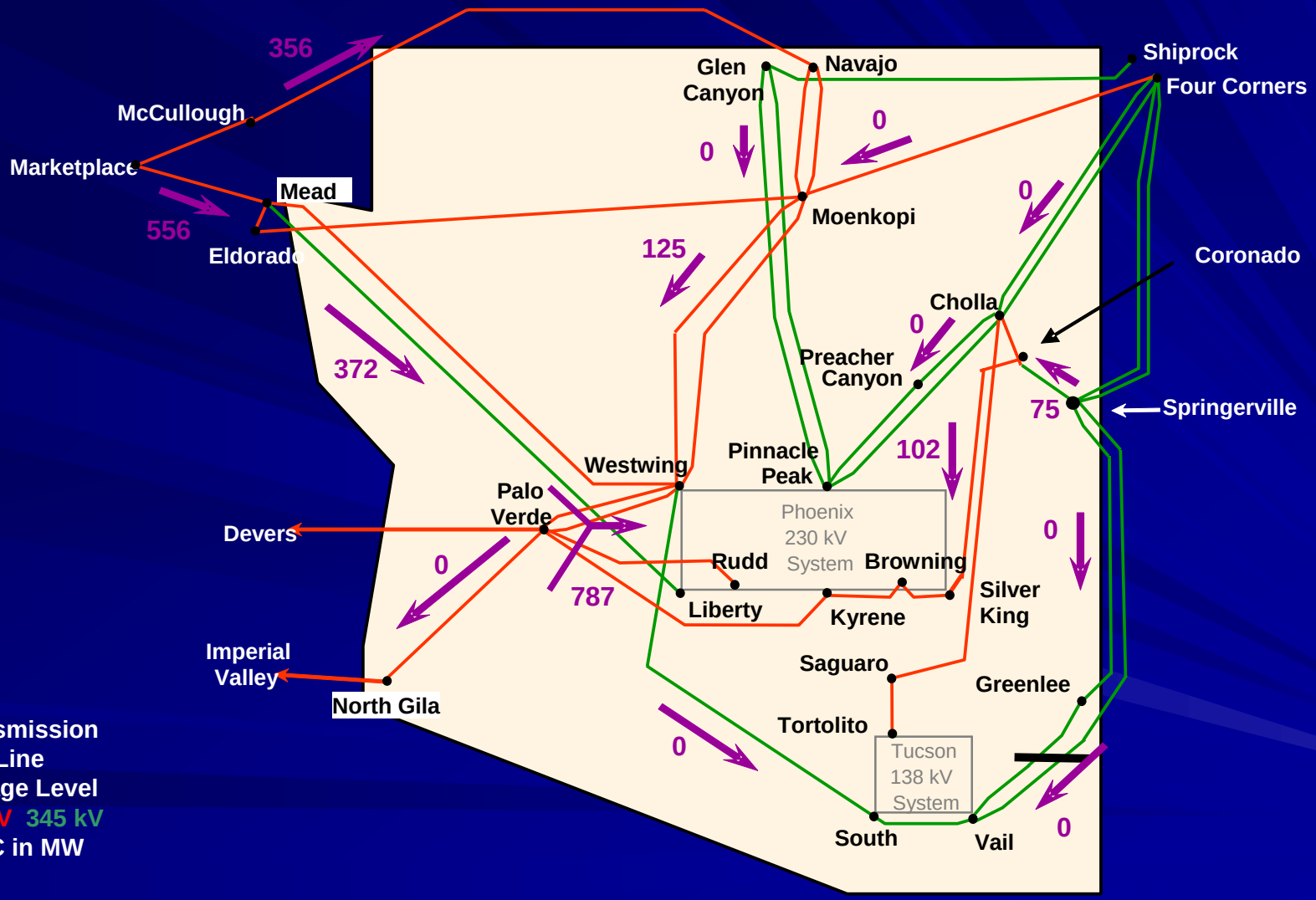
SWAT RTTF Phase #1
AZ BTA Order Response Task Force Meetings

- Two meetings(October 8th and November 16th 2007)
  - Stakeholders and utilities attended
    - Arizona Corporation Commission
    - Utilities
      - Arizona Public Service
      - Salt River Project
      - Tucson Electric Power
      - Southwest Transmission Corporative
      - Southern California Edison
    - Renewable Energy Companies
      - Sky fuel
      - BP Alternative Energy
      - Foresight Wind
      - West Wind Wires
      - Ausra
      - Solar Mission
      - Interwest Energy Alliance
    - Other Stakeholders
      - National Renewable Energy Laboratory
      - Genesee Consulting
      - PDS Consulting
      - K R Saline
      - Stanley Group
      - WSES Consulting
  - 20-30 people were at each meeting
  - Stakeholders and utilities participated in development of a resource map, transmission map, and assess the ATC in Arizona in an open forum to address the BTA

SWAT RTTF
Part 1 -ATC Assessment

- This information was developed during stakeholder workshops held October 8th and November 16th 2007 and includes utility (APS, SRP, SWTC, and TEP) ACC staff and stakeholder input.
- Available Transfer Capability (ATC) has been gathered for each utility in Arizona
- ATC is a dynamic number that can change from day to day. Values observed in June 2007 are used to illustrate the status of the ATC in the Arizona transmission system.

Arizona EHV Transmission ATC (as of June 2007)



Transmission Line Voltage Level
500 kV 345 kV
ATC in MW

SWAT RTTF
Part 2 - Resource Projection

- The renewable resource map was developed during workshop meetings on Oct 8th and Nov 16th 2007
- A renewable resource map displaying areas where resources development potentially could occur and was developed with input from three specific areas
  - The Arizona Renewable Energy Assessment recently prepared for APS, SRP and TEP by Black and Veatch (2007)
  - The queue for renewable resource in Arizona requesting potential interconnection (as of October 15th 2007)
  - Stakeholder/developer input on prospective development opportunities.
  - The # of MW display on the map is the highest out of the three inputs.

Black & Veatch Summary

Projected Resource Locations

1. Solar CSP/Yuma – 800MW
2. Solar CSP/Stoval – 1,900MW
3. Solar CSP/Phoenix – 800MW
4. Solar CSP/Tucson – 800MW
5. Wind/Project KS – 18MW
6. Wind/Project RS – 140MW
7. Wind/Project BR – 158MW
8. Wind/Project CV – 597MW
9. Wind/Project BH – 46MW
10. Wind/Project GP – 31MW
11. Biomass/Biogas – 60MW (22 sites)
12. Geothermal/Clifton – 35MW
13. Hydro – 82MW (7 sites, 90% @ GC)

September 21st 2007

B & V Summary Filters

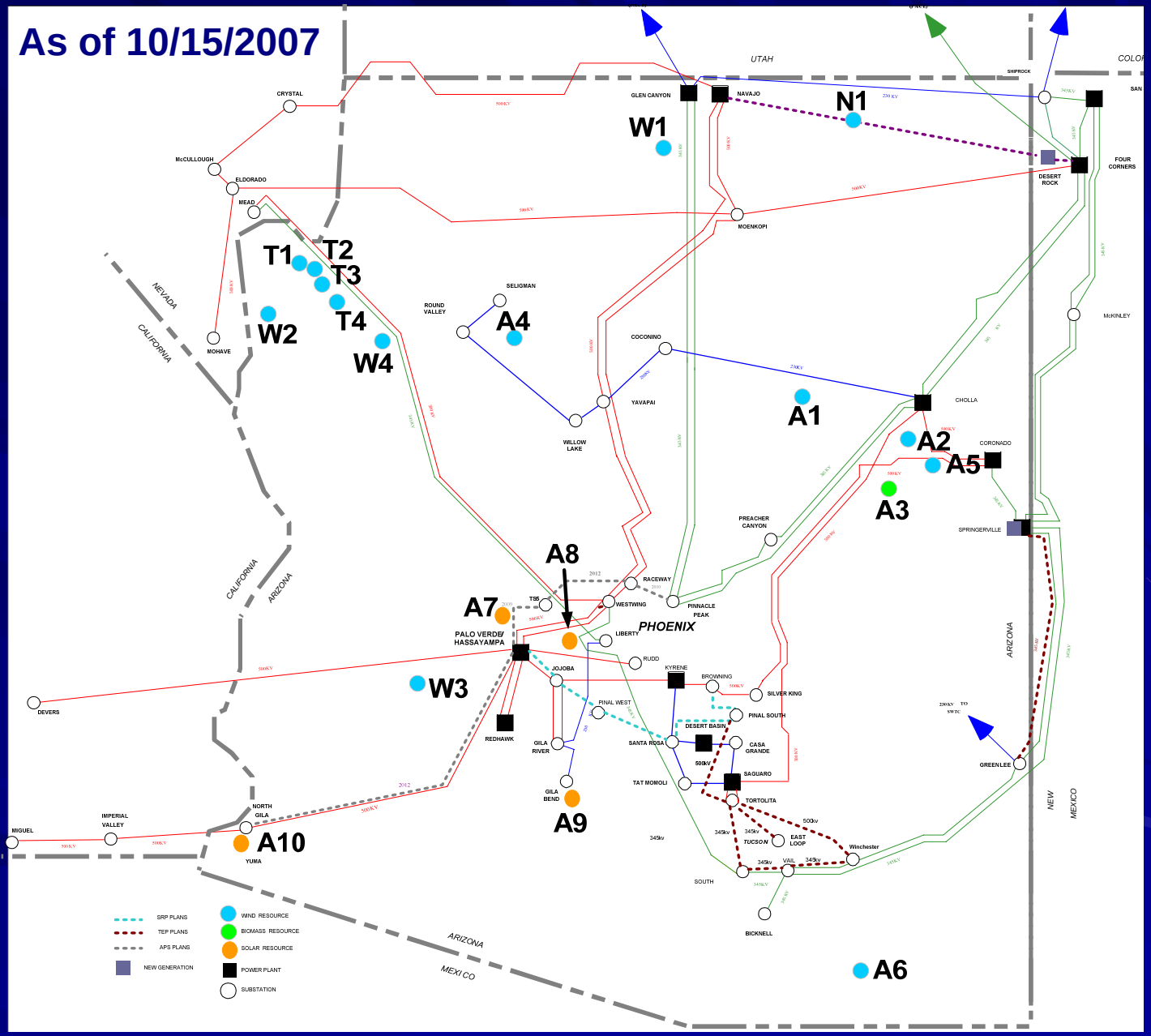
- **Solar Thermal**
  - Equipment availability/supply chain
  - Development timelines/engineering support
  - Project economics
  - Proximity to adequate transmission
  - Land availability/terrain slope/proximity to sensitive areas
- **Wind**
  - Equipment availability/supply chain
  - Class/Capacity factor
  - Project economics
  - Proximity to adequate transmission
  - Proximity to federal/environmental sensitive areas

Arizona Renewable Resource Queue

Code	Company	COD	MW Size	POI	County	Type
T1	TEP	2005	80	Dolan Springs Sub	Mohave	Wind
T2	TEP	2008	15	Dolan Springs Sub	Mohave	Wind
T3	TEP	2005	15	Dolan Springs Sub	Mohave	Wind
T4	TEP	2007	95	Co-Spr	St Johns	Wind
A1	APS	2008	60	Cholla - Coconino	Coconino	Wind
A2	APS	2008	128	Cholla Show	Coconino	Wind
A3	APS	2007	22	Cholla zeniff	Coconino	Biomass
A4	APS	2008	270	Ashofork - Pollock	Coconino	Wind
A5	APS	2009	250.5	cholla - show	Coconino	Wind
A6	APS	2010	100	Adams - Mural	Cochise	Wind
A7	APS	2011	110	Harquahala Jnc	Maricopa	Solar
A8	APS	2011	110	Panda Liberty line	Maricopa	Solar
A9	APS	2010	300	Gila Bend	Maricopa	Solar
A10	APS	2010	400	North Gila Sub	Yuma	Solar
W1	WAPA	2008	500	Tap on 345kV Glen Canyon-Pinnacle Peak	Coconino	Wind
W2	WAPA	2008	300	Mead - Davis 230 kV Line	Mohave	Wind
W3	WAPA	2008	65.1	Goldmine Tap Substation	Imperial	Wind
W4	WAPA	2008	500	Peacock Substation	Mohave	Wind
N1	Navajo Nation		100			Wind
Total			3420.6	As of 10/15/2007		

Arizona Renewable Resource Queue

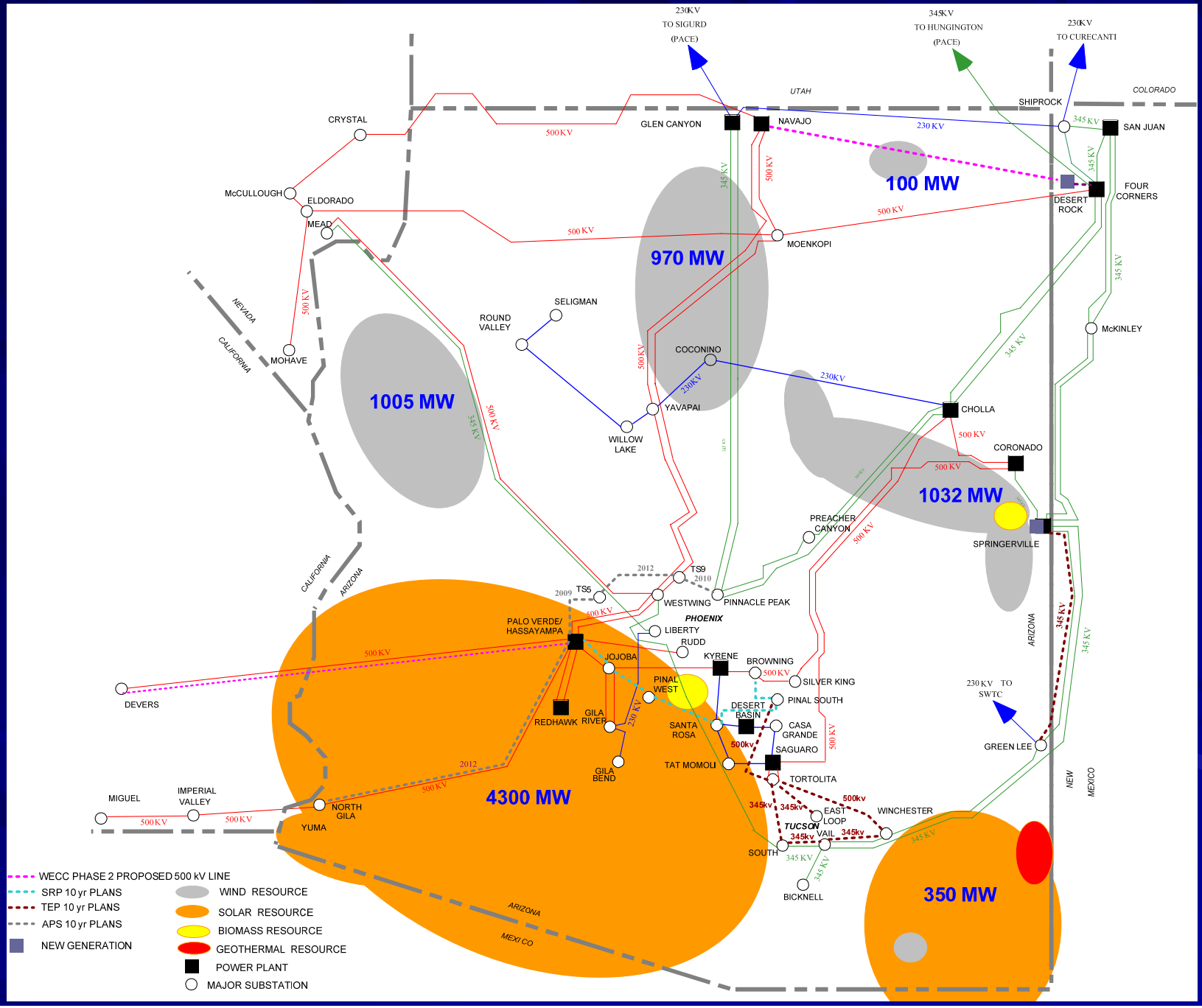
Code	MW Size
T1	80
T2	15
T3	15
T4	95
A1	60
A2	128
A3	22
A4	270
A5	250.5
A6	100
A7	110
A8	110
A9	300
A10	400
W1	500
W2	300
W3	65.1
W4	500
N1	100



SWAT RTTF
Part 2 - Resource Projection

- The map is intended to provide an overview of the potential, renewable resources within Arizona, which include wind, solar, biomass, hydro and/or geothermal and identifies those resources as clusters.
- Since both geothermal and biomass/biogas opportunities are small relative to both solar and wind opportunities, they have been included within the total which is described as generally wind and solar clusters.

Potential Arizona Renewable Resources



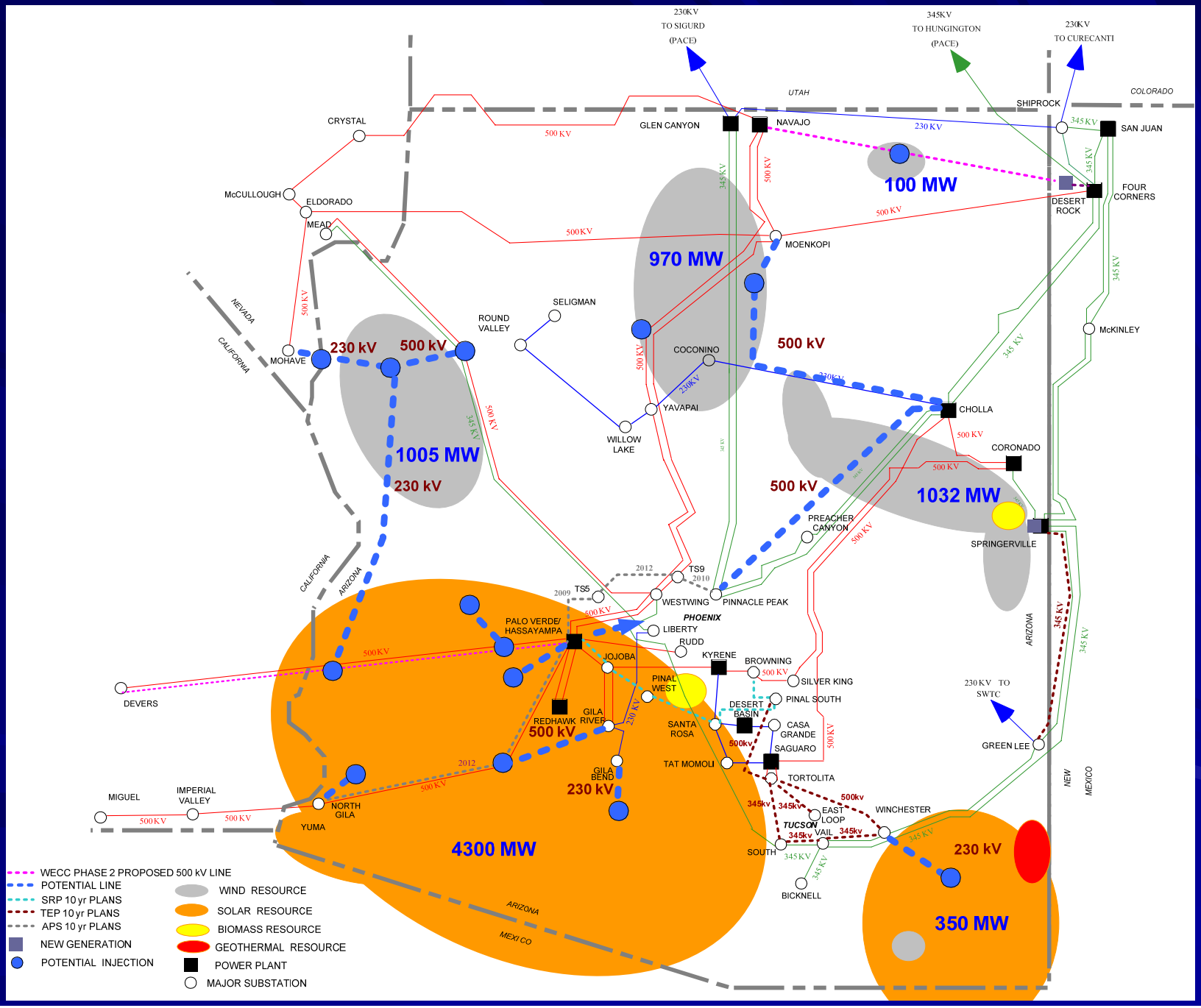
SWAT RTTF
Part 3 - Transmission System

- During the October 8th and November 16th 2007 meetings, transmission alternatives for bringing the renewable energy resources to load were discussed.
- Mapping was developed which represents the potential transmission lines that would be necessary if ***all*** of the renewable resources were to be developed in Arizona.

SWAT RTTF
Part 3 - Transmission System

- Included in the map are:
  - existing transmission lines
  - APS, SRP and TEP 10 year plans
  - other WECC Projects in Phase II process
  - potential transmission lines

Potential Configuration for Transmission to Serve All Available Renewable Resources in Arizona



Estimated Construction Costs

Substation Additions	
Voltage (kV)	# of Substations Added
500	11
230	3

Transmission Circuits	
Voltage (kV)	Miles
500	445
230	247

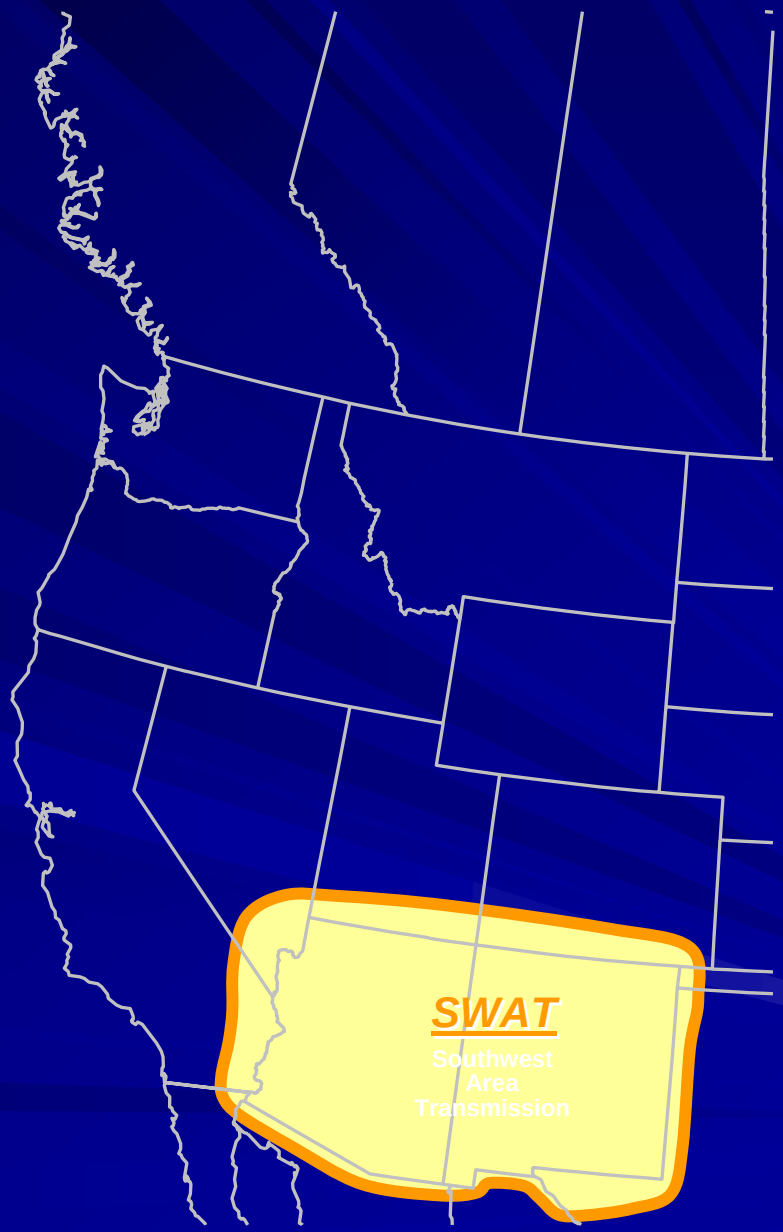
Totals	
	Cost (Million)
Substations	$130
Lines	$1,500
Total	$1,630

SWAT RTTF
Phase #2 – Evaluation and Integration of Renewable Resources into the Southwest Transmission Network

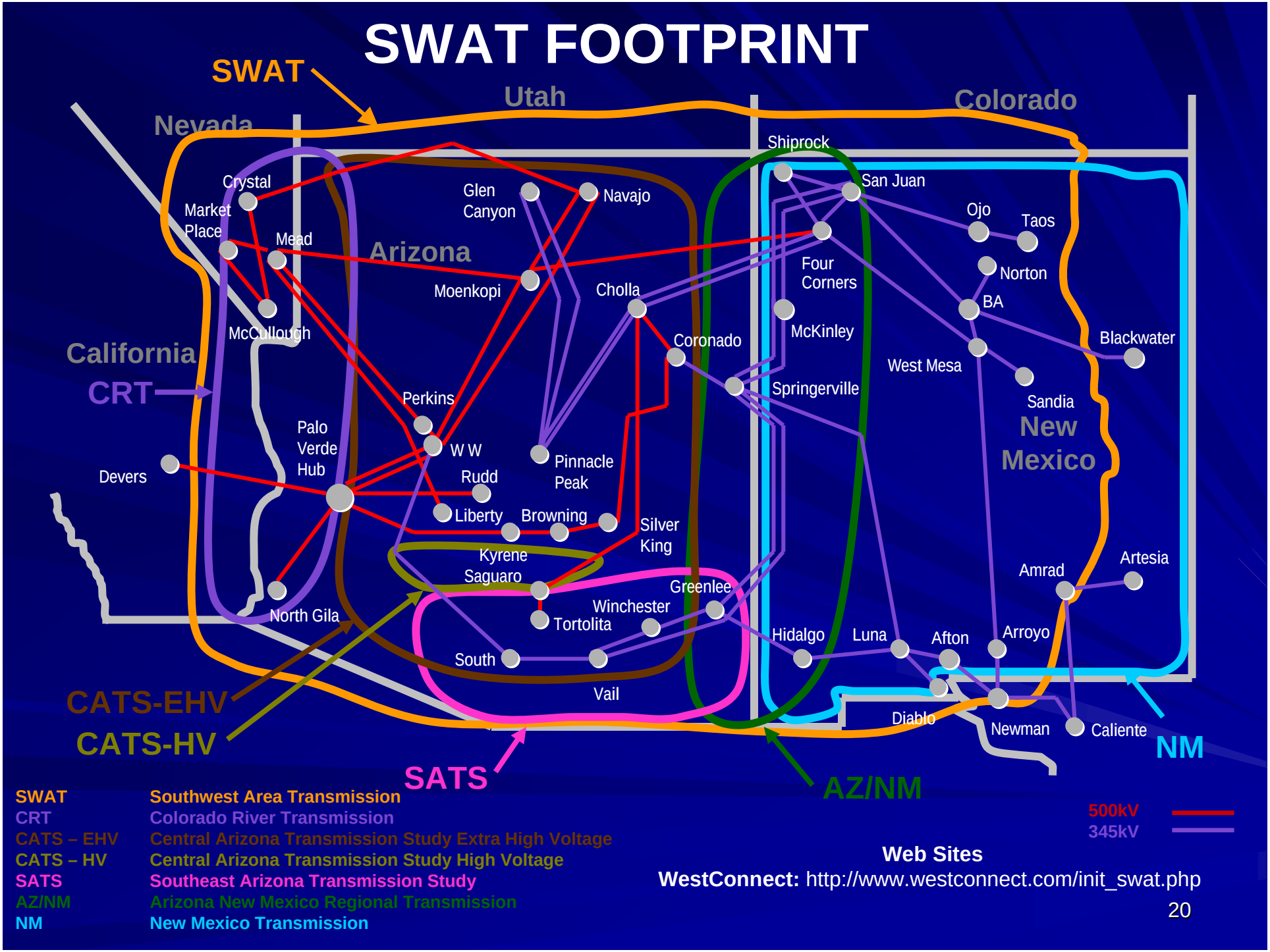
- Workshop Meetings held on April 7th and May 19th 2008
  - Renewable resource projection development
  - Potential transmission additions are in development for the entire SWAT area
- Renewable Taskforce has been extended to the entire SWAT area and includes Arizona, New Mexico, Nevada and Eastern California
- Power flow studies will be developed based on the transmission alternatives

SWAT Footprint
One of the WestConnect Sub-Regional Planning Groups

http://www.westconnect.com



SWAT FOOTPRINT



SWAT	Southwest Area Transmission
CRT	Colorado River Transmission
CATS – EHV	Central Arizona Transmission Study Extra High Voltage
CATS – HV	Central Arizona Transmission Study High Voltage
SATS	Southeast Arizona Transmission Study
AZ/NM	Arizona New Mexico Regional Transmission
NM	New Mexico Transmission

500kV
345kV

Web Sites

WestConnect: http://www.westconnect.com/init_swat.php

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