

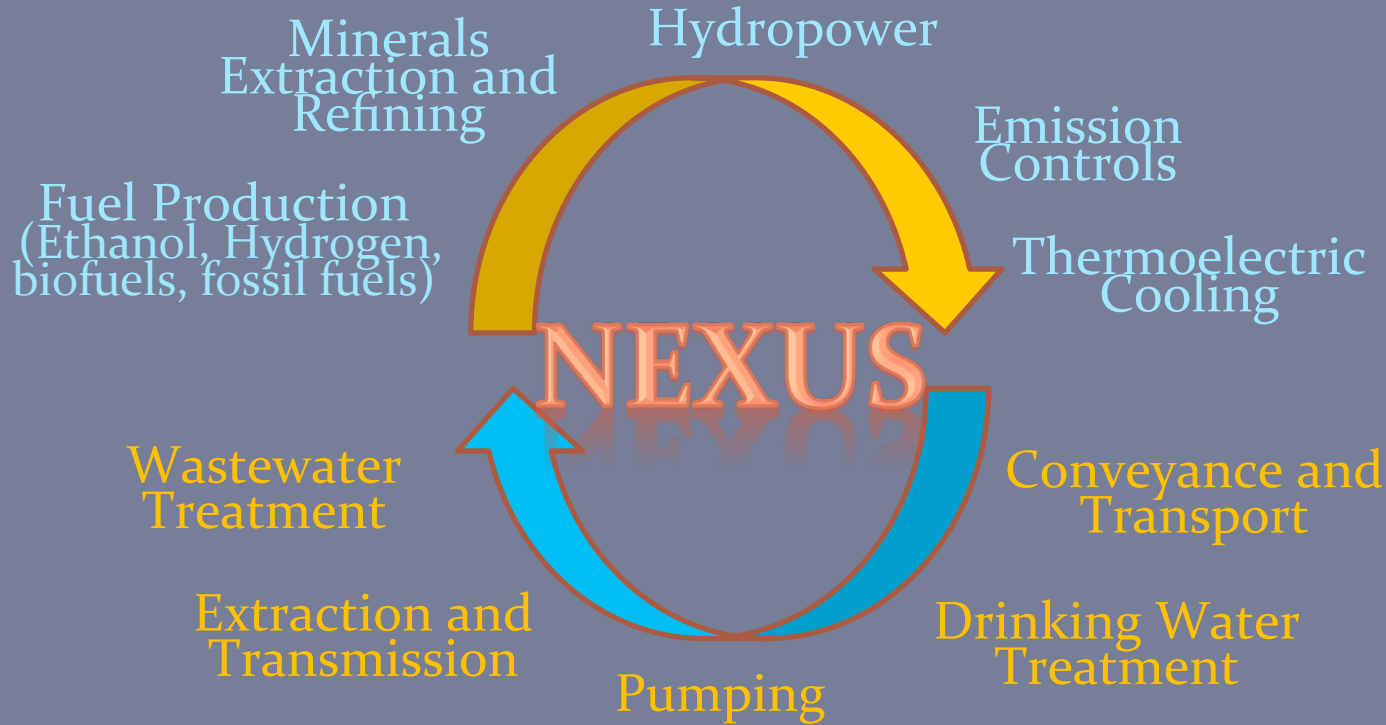
THE WATER-ENERGY NEXUS DIMENSION OF THE CENTRAL ARIZONA PROJECT SYSTEM USE AGREEMENT

Beth Kleiman

October 21, 2016

WRRC Brown Bag Seminar

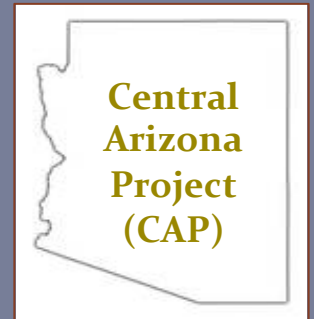
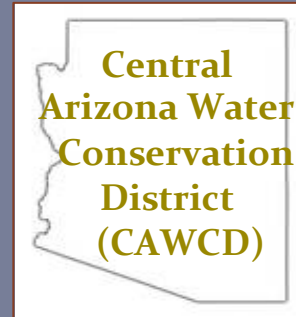
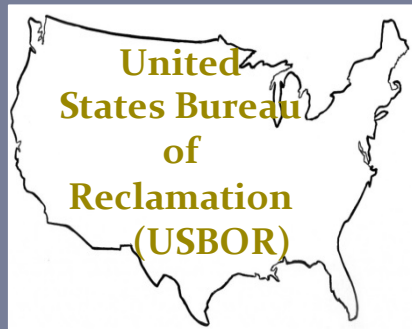
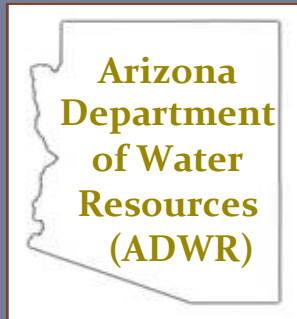
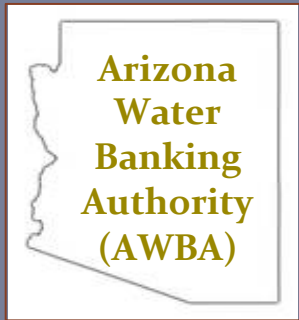
Water for Energy



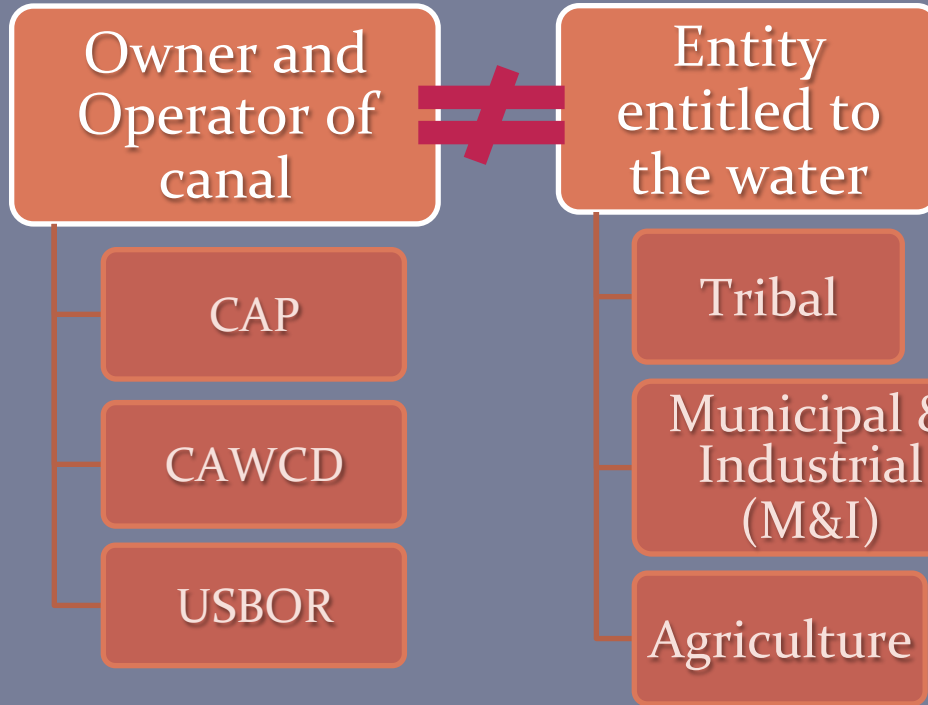
Energy for Water

- How will the *System Use Agreement* affect CAP's energy use and costs?

SYSTEM USE AGREEMENT



CAUSE FOR AGREEMENT



**RESOLVE
LEGAL,
FINANCIAL, AND
OBLIGATIONAL
ISSUES**

AGREEMENT BENEFITS

System Flexibility

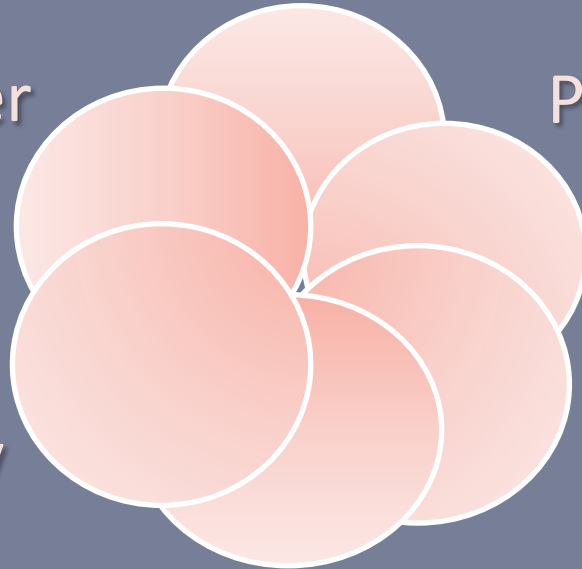
Cut-to-the-Aquifer
Benefits

Potential Conflict
Reduction

Ensured
Reliability

Definitions of
Terms

Maximize
System Benefits



TERMS

WHEELING

Using CAP canal to transport any water other than CAP's normal Colorado River supply

FIRMING

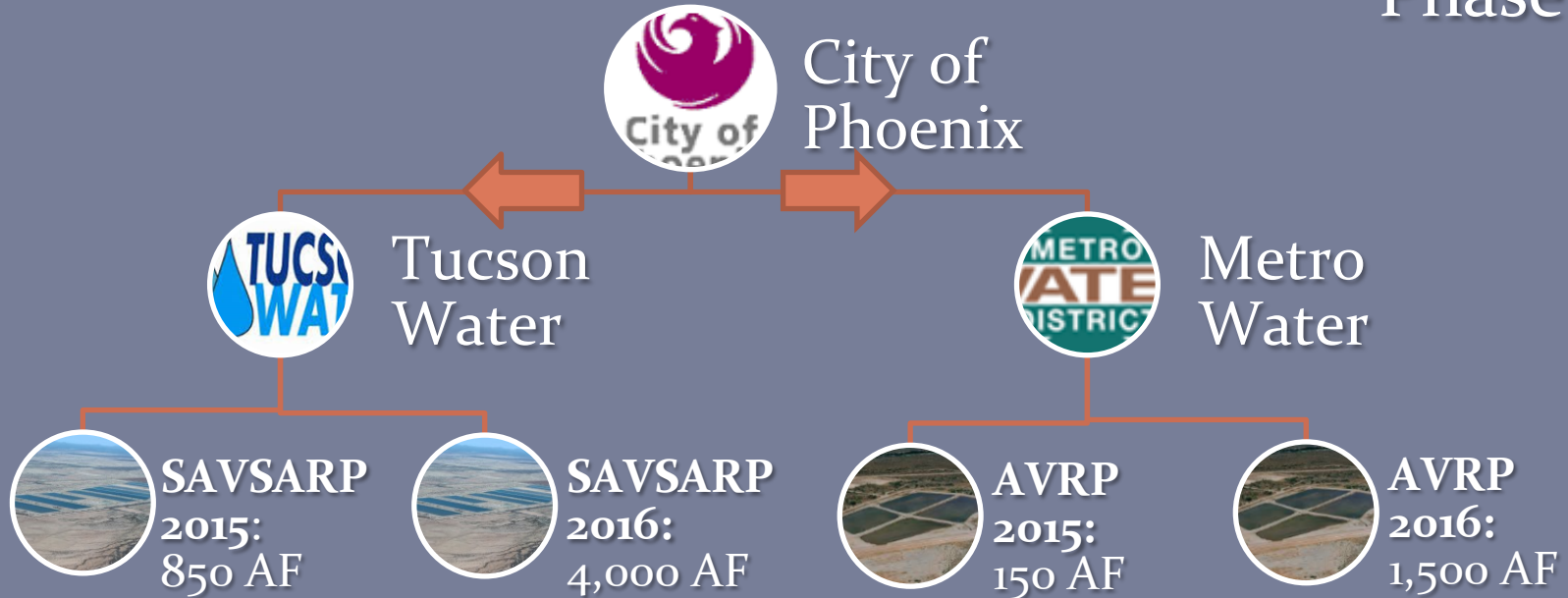
Storage and Recovery of unused CAP water

EXCHANGES

Voluntary water exchanges with CAP's long-term contractors

INTER-AMA FIRMIING

Phase 1



Where does CAP get its energy from?

NAVAJO
KAYENTA
GENERATING
STATION



Courtesy of Arizona Department of Mines and Mineral Resources



San Xavier

Mine Rd

AIR QUALITY

EPA Plans

1999
Regional Haze Rule

2013
Best Available
Retrofit
Technology (BART)

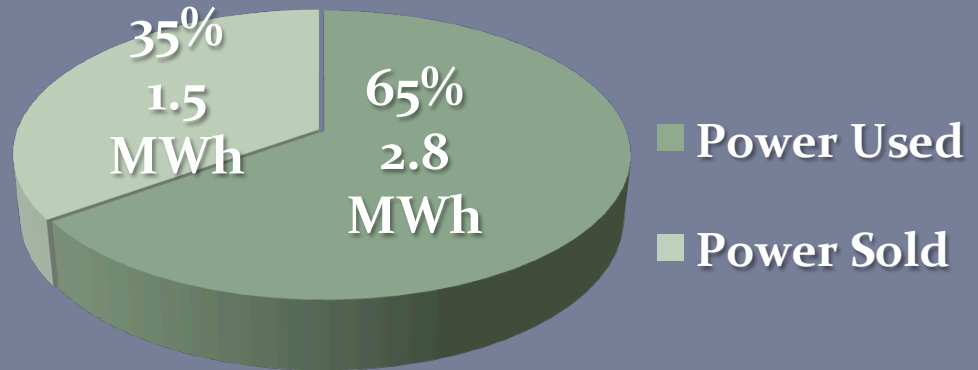
2015
Clean Power Plan
(CPP)



NGS POWER

❖ 4.3 million MWh generated annually

❖ \$30/MWh



❖ \$120 million in 2016

SURPLUS POWER

\$1.65 billion to be repaid to federal government for construction of CAP.

Annual repayment by CAP is \$50 million

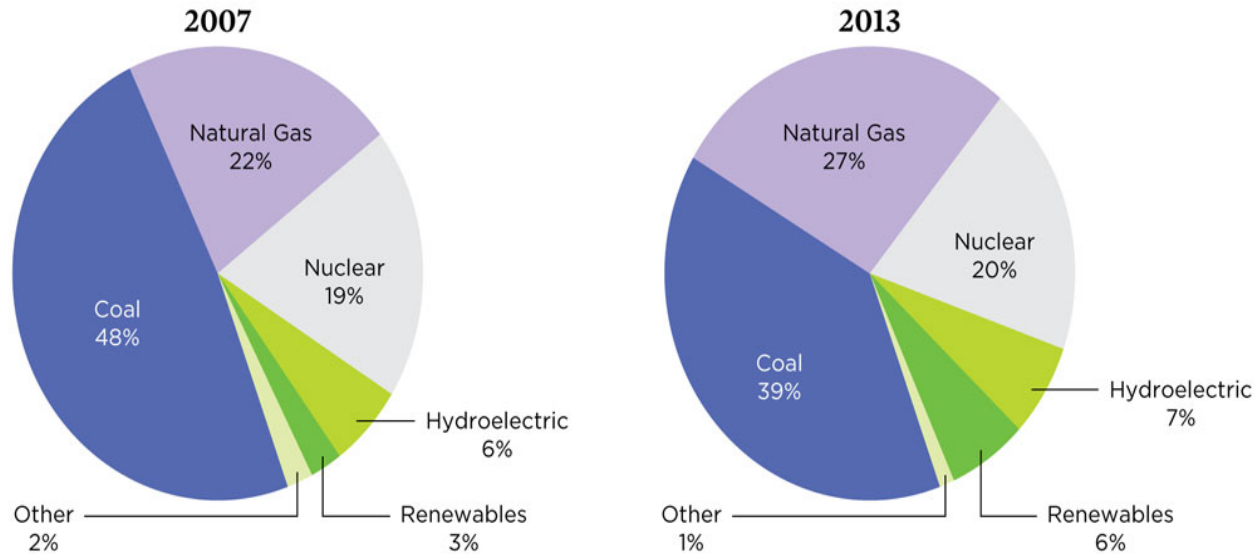
Funds for federal repayment come from sale of excess power generated by NGS

Sold by Western Area Power Authority (WAPA)

Full repayment scheduled by 2044

FUTURE ENERGY SOURCES

FIGURE 2. Change in U.S. Electricity Generation Mix, 2007 to 2013



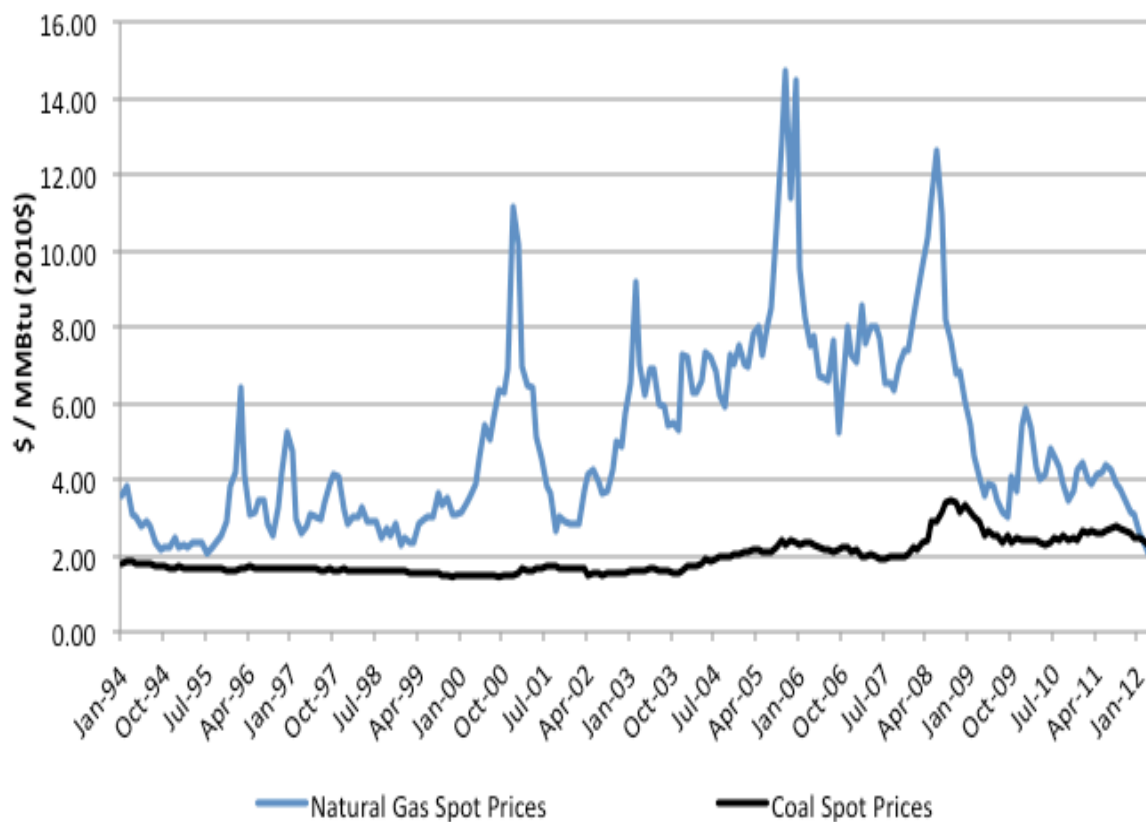
A combination of market and policy factors has contributed to a major shift in the makeup of the U.S. electricity generation mix from 2007 through 2013. As coal generation declined, it was replaced by generation from a combination of cleaner power sources—led by natural gas.

SOURCE: EIA 2014A.

© Union of Concerned Scientists 2015; www.ucsusa.org/naturalgasgamble

NATURAL GAS PRICES

Figure 3: Coal & Natural Gas Spot Prices, in Real Terms¹



Source: U.S. Energy Information Administration, NYMEX, Bureau of Labor Statistics, St. Louis Federal Reserve

- How will the *System Use Agreement* affect CAP's energy use and costs?



❖ Number of pumping plants

❖ Number of additional water deliveries

CONCLUSION



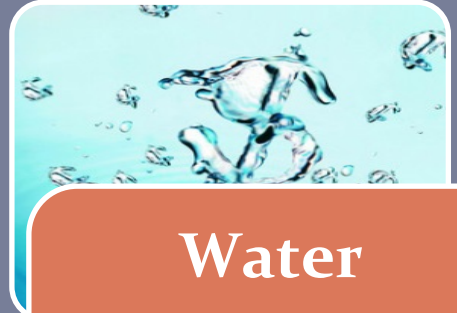
Government Regulation

- Air Quality
- Climate Change



Energy Source

- Future of NGS
- Potential new sources
- Price fluctuation
- Changing Technology



Water

- Cost/Rates
- Federal Repayment
- AZ Water Settlements
- Groundwater pumping

SPECIAL THANKS TO:

Mitch Basefsky

Central Arizona Project

Michael Block

Metropolitan Water District

Molly Collins

Tucson Water

Dee Korich

Tucson Water

Michael Liberti

Tucson Water

Alyssa Miller

Montgomery & Associates

Ken Seasholes

Central Arizona Project

Margaret Snyder

Tucson Water

Maya Teyechea

Tucson Water

Dick Thompson

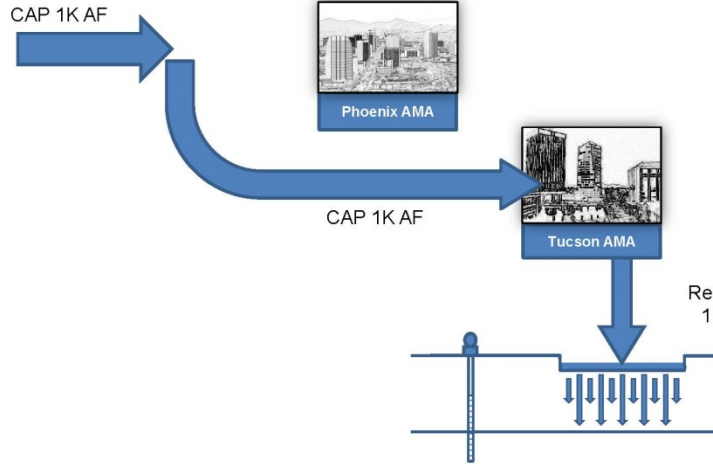
Tucson Water

Wally Wilson

Tucson Water

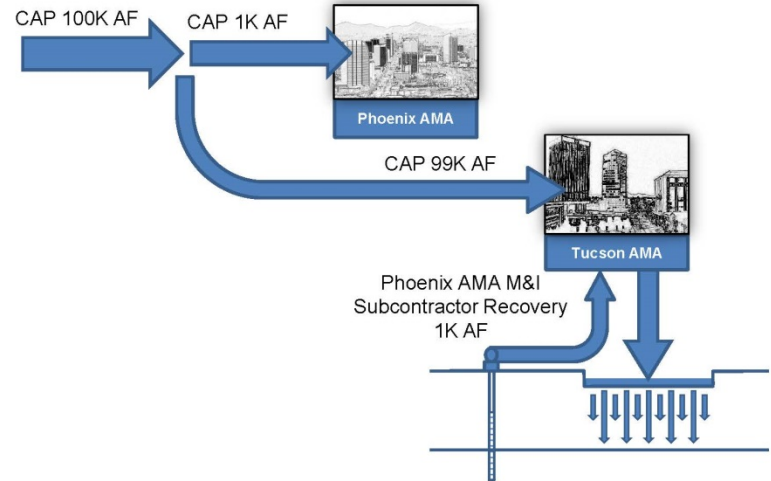
Pilot Phase - Year 1

Phx AMA M&I
Subcontractor Order
Up to 1K AF

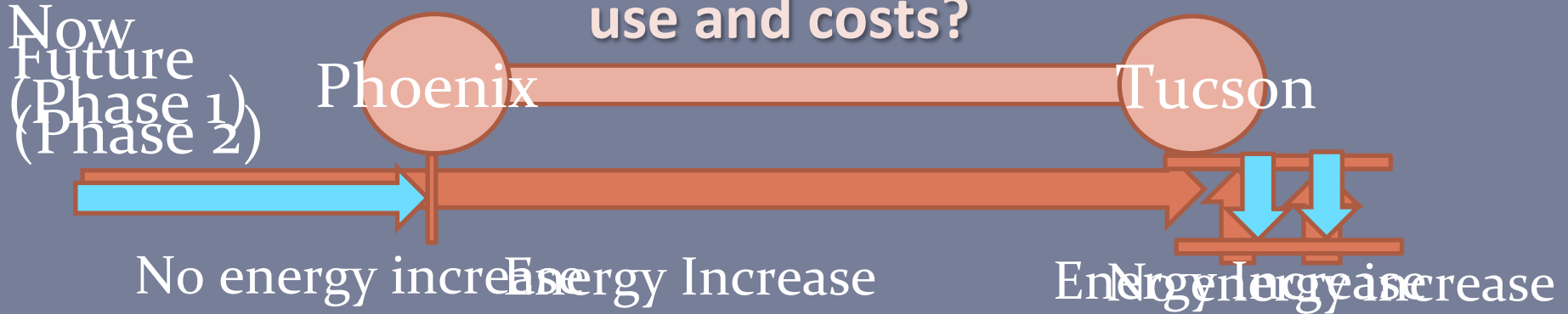


Pilot Phase - Year 2

TAMA M&I
Subcontract Order
100K AF



How will the *System Use Agreement* affect CAP's energy use and costs?



❖ Number of pumping plants

❖ Future vs. current energy

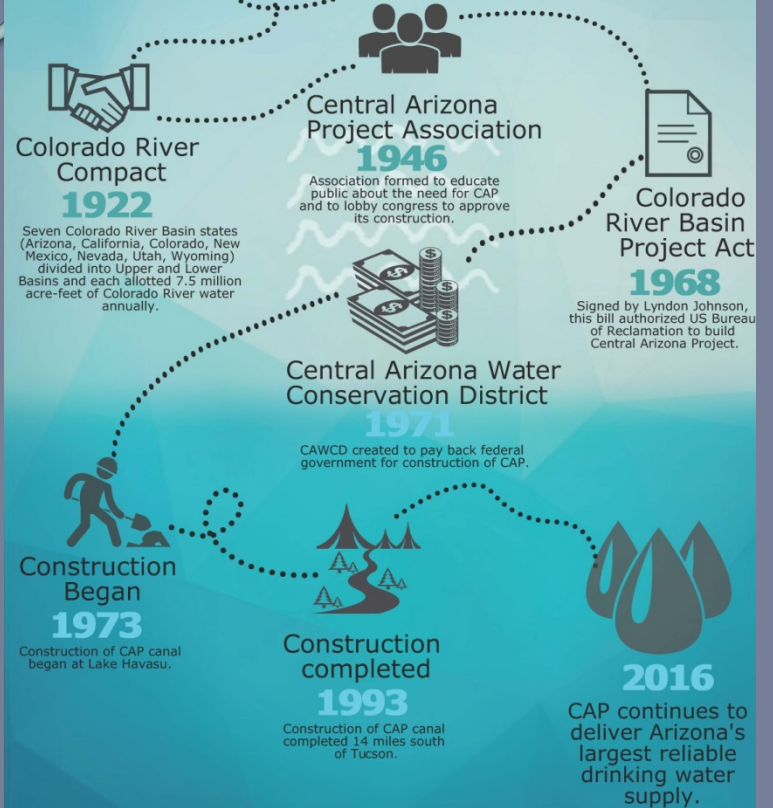
❖ Number of additional water deliveries

CAP Background



History of Central Arizona Project

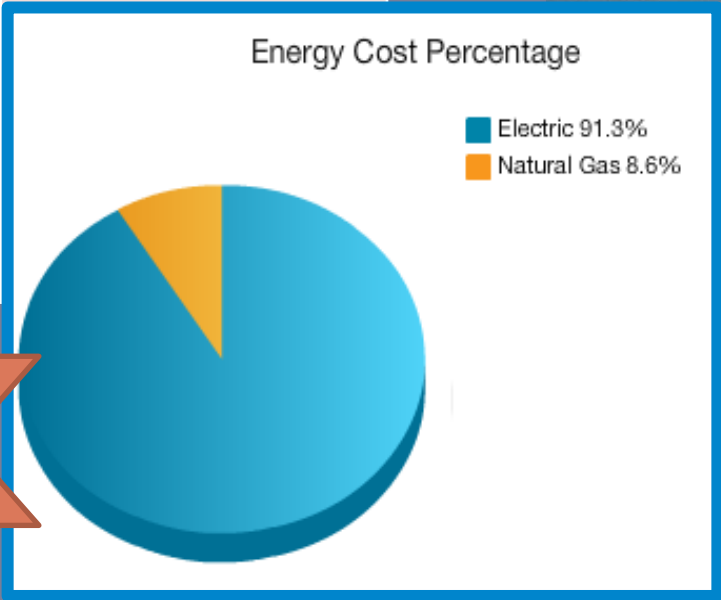
1922-2016



Energy Costs of Recovery

Tucson Water Energy Expenditures at Clearwater Recharge Facilities 2015

2015	Electric	Gas	
CAVSARP	\$4,440,060	\$1,114,194	Total CAVSARP Energy Costs: \$5,554,254
SAVSARP	\$1,442,704	\$208,925	Total SAVSARP Energy Costs \$1,651,629
	Total Electric Costs: \$5,882,764	Total Gas Costs: \$1,323,119	

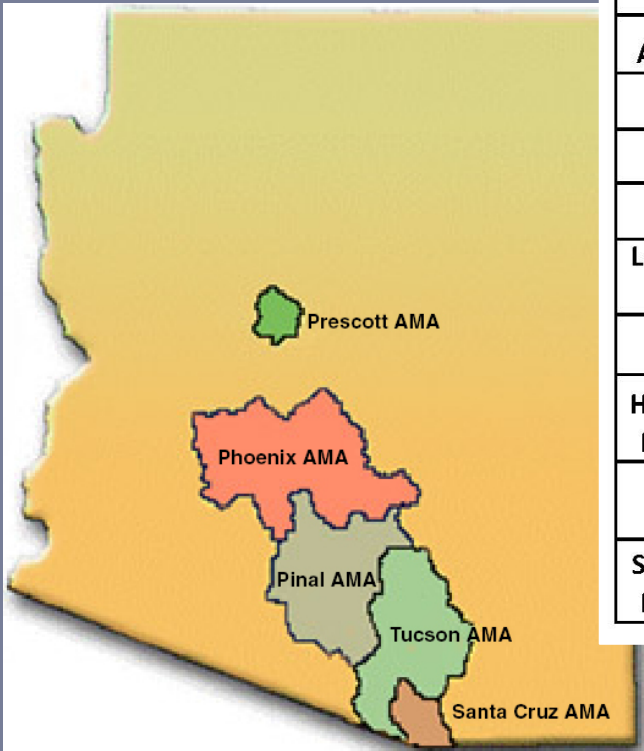


**Total :
\$7,205,883**



Recharge Projects

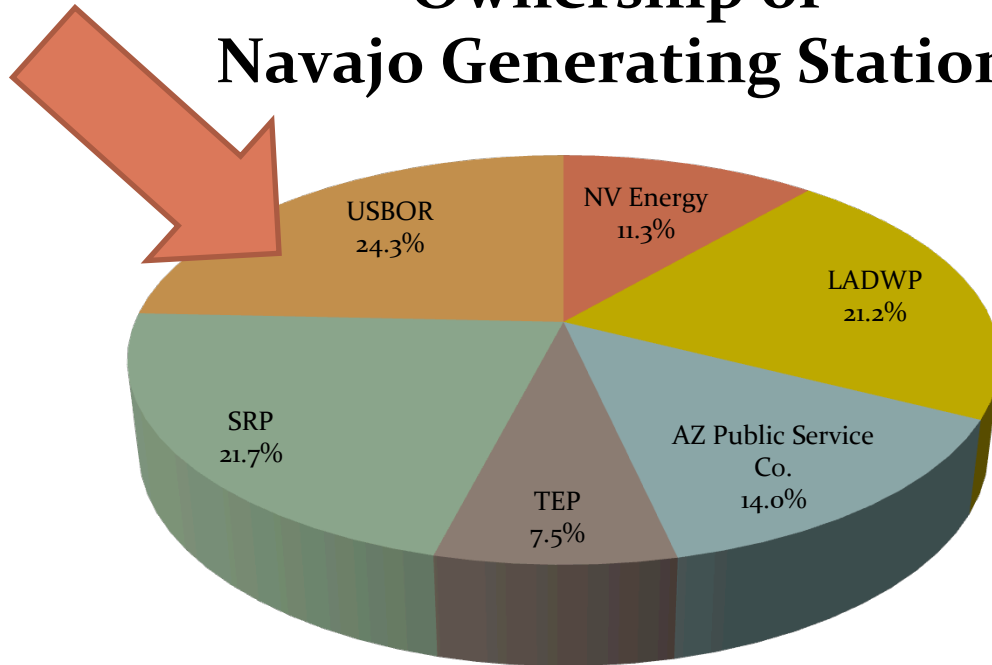
Project Name	AMA	Year complete	Permitted capacity	Permittee	acreage	# of basins	Water Type
Avra Valley	Tucson	1996-97	11,000	Metro Water	11	4	CAP
SAVSARP	Tucson	2008	75,000	City of Tucson	226	9	CAP
CAVSARP	Tucson	2007	75,000	City of Tucson	317	11	CAP
PMR	Tucson	1998-99	30,000	CAWCD	37	5	CAP
Lower Santa Cruz	Tucson	2000	50,000	CAWCD	28	3	Effluent
Agua Fria	Phoenix	2001	100,000	CAWCD	102	7	CAP
Hieroglyphic Mountains	Phoenix	2002	35,000	CAWCD	38	7	CAP
Tonopah Desert	Phoenix	2006	150,000	CAWCD	207	19	CAP
Superstition Mountains	Phoenix	2011	25,000	CAWCD	39	2	CAP



Active Management Areas

Navajo Generating Station

Ownership of Navajo Generating Station

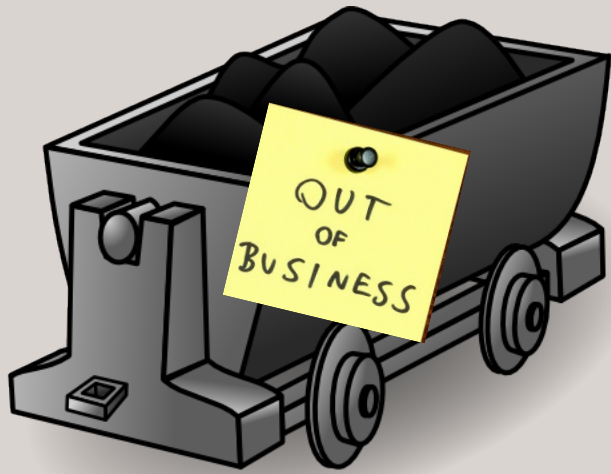


- United States Bureau of Reclamation
- Salt River Project
- Los Angeles Department of Water and Power
- Nevada Energy
- Arizona Public Service Co.
- Tucson Electric Power



Peabody Energy Corp.





Another source of coal?

What cost?

CAP energy budget

- Largest expense
- \$30/MWh for 2016
- Total of 4.2 million MWh
- \$120 million

NGS closure

- Higher cost of power for CAP
- Higher cost of water delivery for CAP customers
- CAP to lose at least \$50 million in annual revenue
- Effects on Federal repayment
- Indian communities to lose millions in revenue; jeopardized water settlements
- Increased groundwater pumping?



OR

