

Underground Arizona

undergroundarizona.org

Daniel Dempsey, Underground Arizona

Licensed Research Analyst, Citigroup Global Markets

- Covered U.S. and Canadian energy companies on behalf of Citigroup and its institutional clients.
- Approved or denied large investments based on research and analysis, including IPOs and private debt and equity offerings.
- Reviewed, evaluated, and discussed strategy and results with company executives and investors.

Analyst & Asset Manager, Various Institutional Investors

- Determine large investment decisions based on analysis of private and public data.
- Evaluate the performance of large investments and adjust as necessary.
- FINRA Series 7, 63, 86, and 87 Licenses. Arizona Real Estate Brokers License. See Exhibits UAZ-51 and UAZ-52.

Statutory Factors 1, 5, 6, and 8

40-360.06. Factors to be considered in issuing a certificate of environmental compatibility.

A. The committee may approve or deny an application and may impose reasonable conditions on the issuance of a certificate of environmental compatibility and in so doing shall consider the following factors as a basis for its action with respect to the suitability of either plant or transmission line siting plans:

1. Existing plans of this state, local government and private entities for other developments at or in the vicinity of the proposed site.
5. Existing scenic areas, historic sites and structures or archaeological sites at or in the vicinity of the proposed site.
6. The total environment of the area.
8. The estimated cost of the facilities and site as proposed by the applicant and the estimated cost of the facilities and site as recommended by the committee, recognizing that any significant increase in costs represents a potential increase in the cost of electric energy to the customers or the applicant.

TEP Cost Claim 1

1. *“The clear and longstanding practice in Arizona has been that the proponent of undergrounding—rather than the utility—pays for the extra cost of undergrounding.”* p28

SRP regularly pays for undergrounding Case 195



Agreement Terms

- Undergrounding of 230kV lines along City rights-of way through established neighborhoods near Intel
 - Unanimously approved by Chandler City Council on **July 24, 2021**
 - Chandler agrees to pay the cost differential between the overhead construction and undergrounding of the transmission lines via SRP aesthetics program
 - City to relocate City-owned utilities in right-of-way
 - City to provide dedicated easement for undergrounded lines to be located in City of Chandler right-of-way
 - Provides for mitigation of temporary construction impacts
 - City agreed to allow overhead lines along the border of its Chandler Ocotillo Water Reclamation Plant as there is no impact on Chandler businesses or residents



SRP regularly pays for undergrounding

Salt River Project
Summary of Municipal Aesthetics Program Allocation
(\$ Thousands)

Description	FY24	FY25	\$	%
	Budget	Budget	Change	Change
Municipal Aesthetics Program	\$ 18,000	\$ 18,000	\$ 0	0.0%

Note: The Municipal Aesthetics Program Fund balance as of January 31,2024 is \$75,671,346.

APS also pays for undergrounding



Central Phoenix Line Upgrade

[Home](#)[Project Area Map](#)[Current Work Schedule](#)[FAQs](#)[Contact](#)[English](#)

Upgrades Planned for APS Central Phoenix Line

APS will soon upgrade a critical underground transmission line in central Phoenix – the “backbone” of the metro Phoenix 230kV transmission system. This project supports reliability for customers by replacing a line that is reaching the end of its design life and expanding the capacity of the line to support customers’ growing energy needs.

There are three components to this phase of the project:

1. Upgrades to the Country Club Substation, located at 608 E. Sheridan Street;
2. upgrades to the Lincoln Street South Substation, located at 305 W. Lincoln Street; and
3. replacing and upgrading the underground 230kV cable (power line) between the two substations.



APS regularly pays for undergrounding

Name of Respondent: Arizona Public Service Company	This report is: (1) ☒ An Original (2) ☐ A Resubmission	Date of Report: 03/27/2024	Year/Period of Report End of: 2023/ Q4
CONSTRUCTION WORK IN PROGRESS - - ELECTRIC (Account 107)			
1. Report below descriptions and balances at end of year of projects in process of construction (107). 2. Show items relating to "research, development, and demonstration" projects last, under a caption Research, Development, and Demonstrating (see Account 107 of the Uniform System of Accounts). 3. Minor projects (5% of the Balance End of the Year for Account 107 or \$1,000,000, whichever is less) may be grouped.			
Line No.	Description of Project (a)	Construction work in progress - Electric (Account 107) (b)	
57	Strategic Telecom Project	34,376,785	
58	HPFF Mitigation Phase 1	27,816,798	
59	Three Rivers Sub/Compass Phase 2	26,148,405	
60	Westwing 69kV Yard Breaker Upgrades	20,019,115	
92	North Gila - TS8 230	1,584,936	
93	HPFF Mitigation Phase 0	1,528,394	
94	TS23 - 230/69kV Sub Sun Val-Morgan	1,515,135	

\$29.3 million / 3.5 miles

=

\$8.4 million/mile just for mitigation

Recent APS Underground Projects

Recent Arizona Undergrounding Projects*									
#	Project Name	Location	Year	Co.	Voltage	Miles	Circuits	Cost	Cost/Mile/Circuit
1	County Line-Buyan	Gila Bend	2020	APS	69kV	4.5	1	\$13,689,972	\$3,042,216
2	Ocotillo-Tempe	Tempe	2020	APS	69kV	0.8	1	\$8,096,061	\$10,120,076
3	Indianola-Midtown	Central Phoenix	2019	APS	69kV	0.6	1	\$2,954,869	\$4,924,782
4	Country Club-Midtown	Central Phoenix	2019	APS	69kV	0.2	1	\$984,956	\$4,924,780
5	Commerce-Turf	North Phoenix	2019	APS	69kV	0.5	1	\$1,037,550	\$2,075,100
6	Commerce-Deer Valley	North Phoenix	2019	APS	69kV	0.5	1	\$1,037,550	\$2,075,100
7	Dale-Via Dona	Scottsdale	2018	APS	69kV	5.2	2	\$5,182,540	\$498,321

APS 2023 Electric Plant In Service: Distribution

Name of Respondent: Arizona Public Service Company		This report is: (1) ☒ An Original (2) ☐ A Resubmission		Date of Report: 03/27/2024	Year/Period of Report End of: 2023/ Q4		
ELECTRIC PLANT IN SERVICE (Account 101, 102, 103 and 106)							
Line No.	Account (a)	Balance Beginning of Year (b)	Additions (c)	Retirements (d)	Adjustments (e)	Transfers (f)	Balance at End of Year (g)
66	(366) Underground Conduit	838,398,509	13,866,024	29,097			852,235,436
67	(367) Underground Conductors and Devices	2,505,971,317	150,746,188	8,513,447			2,648,204,058

\$3.5 billion @ EOY 2023

ACC Policy Statement 79140

The Commission does not have jurisdiction over the undergrounding of electric transmission lines. A.R.S. § 40-360(10). Installing electric transmission lines underground is much more expensive than building them above ground. Underground transmission lines also can be more costly and challenging to maintain and repair. As a general matter, utilities under the Commission's jurisdiction should avoid incurring these higher costs unless underground installation of a transmission line is necessary for reliability or safety purposes, or to satisfy other prudent operational needs. Installing a transmission line underground for other reasons, such as stakeholders' preferences, would add unnecessarily to costs recovered through rates. Third parties, including cities, customers, and neighborhood groups, seeking to fund the underground construction of a transmission line may do so, among other ways, by forming an improvement district for underground utilities as provided in A.R.S. § 48-620 et. seq. (emphasis added).

Complying with the law is a prudent operational need.

APS vs. Town of Paradise Valley (1980)

The Arizona Supreme Court determined that (at p. 451):

1. *“...local governments can prescribe undergrounding within their boundaries”; and,*
2. *“[alternative funding mechanisms do] not prevent the Town from mandating the undergrounding at utility expense.”; and,*
3. *“[The line siting statutes] evidence[s] a legislative recognition that the cities and towns have the power to act [on high energy transmission lines].”*

TEP vs. City of Tucson (2024)

“[T]he Court finds that, as a matter of law, the City has the authority to require undergrounding of transmission lines.”

TEP Cost Claim 1

1. *“The clear and longstanding practice in Arizona has been that the proponent of undergrounding—rather than the utility—pays for the extra cost of undergrounding.” p28*

**Neither clear nor longstanding
practice in Arizona.**

TEP Cost Claim 2

2. *“[It would cost TEP] \$25 million per mile for an underground line.”* p29

TEP Overhead Cost

Kino to Vine Route Comparison Summary

	Estimated Total Cost	Route Length*	Residential*	Low Income Residential*	Historic Districts*	Existing Overhead Utilities (percent of route)	Overhead Distribution to be Underground*	Overhead Communication to be Underground / Relocated*
Route 1	\$11.8 M	2.9	0.9	0.9	0.6	71%	3.0	8.8
Route 2	\$16.1 M	5.1	1.3	0.6	0.9	55%	3.4	8.3
Route 3	\$14.8 M	5.0	2.3	2.3	1.2	45%	2.2	5.5
Route 4	\$12.8 M	5.0	1.1	1.0	0.5	66%	2.3	7.3
Route 5	\$13.6 M	5.9	1.1	1.1	1.0	42%	1.6	5.4
Route 6	\$14.8 M	7.6	0.7	0.7	1.0	46%	1.5	4.9

*Linear length represented in miles



201

TEP Overhead Cost

Kino to Vine Route Comparison Summary

	Estimated Total Cost	Route Length*	Estimated Total Cost / Route Length*	Estimated Total Cost / Route Length*	Estimated Total Cost / Route Length*	Estimated Total Cost / Route Length*	Estimated Total Cost / Route Length*	Estimated Total Cost / Route Length*	Estimated Total Cost / Route Length*
Route 1	\$11.8 M	2.9							
Route 2	\$16.1 M	5.1							
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Route 5	\$13.6 M	5.9	1.1	1.1	1.0	42%	1.6	5.4	
Route 6	\$14.8 M	7.6	0.7	0.7	1.0	46%	1.5	4.9	

\$11.8m / 2.9 miles

= \$4.1m/mile

*Linear length represented in miles



201

Sargent & Lundy Estimates

Sargent & Lundy													
Rev	Date	Length (miles)	Base Cost /Mile (\$m)	UG Total Cost (\$m)	OH Total Cost (\$4.1m)	UG - OH (\$m)	Diff	UG/Mile -30% (\$m)	UG Total -30% (\$m)	UG - OH -30% (\$m)	Diff		
0	2/11/20	1.5	\$ 9.09	\$ 13.64	\$ 6.15	\$ 7.49	1.22x	\$ 6.37	\$ 9.55	\$ 3.40	0.55x		
1	9/28/20	1.5	\$ 8.24	\$ 12.37	\$ 6.15	\$ 6.22	1.01x	\$ 5.77	\$ 8.66	\$ 2.51	0.41x		
8	6/19/24	2.28	\$ 17.85	\$ 40.69	\$ 9.35	\$ 31.34	3.35x	\$ 12.49	\$ 28.48	\$ 19.14	2.05x		
8-1	6/19/24	1.8	\$ 16.85	\$ 30.33	\$ 7.38	\$ 22.95	3.11x	\$ 11.80	\$ 21.23	\$ 13.85	1.88x		
8-3	6/19/24	0.48	\$ 21.58	\$ 10.36	\$ 1.97	\$ 8.39	4.26x	\$ 15.11	\$ 7.25	\$ 5.28	2.68x		
7-5	9/16/22	0.80	\$ 14.46	\$ 11.63	\$ 3.30	\$ 8.33	2.53x	\$ 10.12	\$ 8.14	\$ 4.84	1.47x		
7-6	9/16/22	0.83	\$ 15.33	\$ 12.80	\$ 3.42	\$ 9.38	2.74x	\$ 10.73	\$ 8.96	\$ 5.54	1.62x		

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Table of Recent Arizona Underground Projects

Recent Arizona Undergrounding Projects*									
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8	Business District	Scottsdale	2018	APS	69	0.78	1	\$2,962,721	\$3,798,360
9	TEP	Tucson	2024	TEP	138	1.0	1	\$25,000,000	\$25,000,000
X	HPFF Mitigation Phase 1	Central Phoenix	2023	APS	230	3.5	1	\$29,345,192	\$8,384,341
10	Intel*	Chandler	2021	SRP	230	2.65	1	\$27,560,000	\$10,400,000
11	Price Road*	Chandler	2018	SRP	230	0.6	2	\$15,800,000	\$13,166,667

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\$3.9m/mile avg for 69kV

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11	Price Road*	Chandler	2018	SRP	230	0.6	2	\$15,800,000	\$13,166,667

\$11.8m/mile avg for 230kV

LSC Case 195: Mr. Heim of SRP Testimony

8 on underground transmission lines. And so like we
9 talked about yesterday, independent of voltage, we find
10 that underground transmission lines cost on the order
11 of 10 to 15 times that of their equivalent overhead
12 line. And then specific to a 230 kV line where the
13 per-mile cost is in the 10 to -- or, 1- to
14 1-and-a-half-million-dollar range per mile, we find
15 that the per-circuit mile equivalent of an underground
16 230 line is in the 10 to \$15 million range.

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LSC Case 195: What did SRP pay?

HIP Cost Breakdown

Transmission Lines and System Upgrades (Funded by SRP)

- HIP 230kV Lines - \$56M⁽¹⁾
- System Upgrades - \$9M
- **SRP Total: \$65M**

Additional Undergrounding Costs (Funded by Others)

- Intel Campus and UPRR Corridor – \$36M by Intel
- Chandler Roadways – \$31M by Chandler⁽²⁾

Substation

- RS-28 – Funded by Intel

(1) Excludes additional underground funding provided by others

(2) Combination of municipal aesthetics funds, ROW contributions, and in-kind services

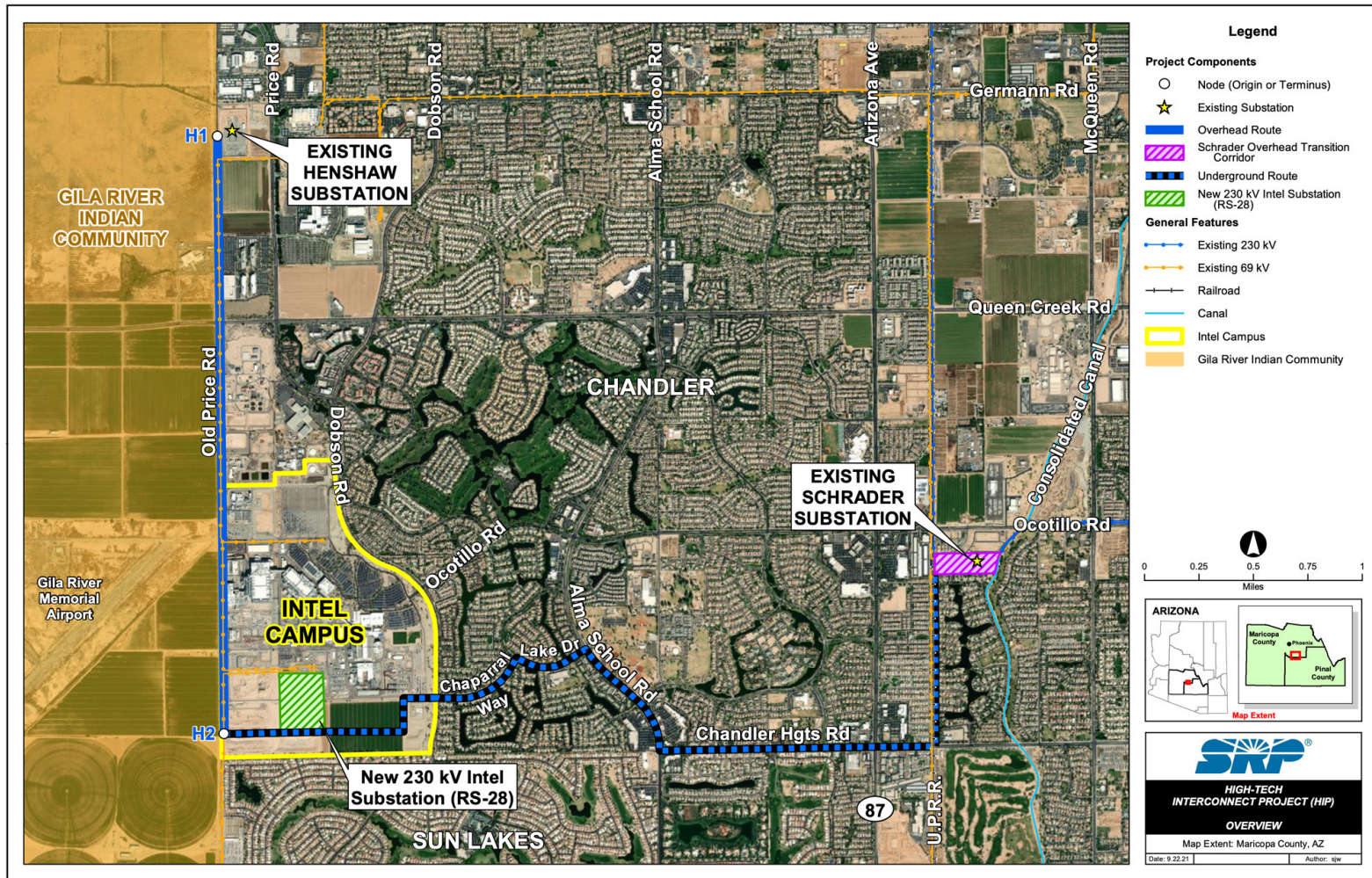
R64

\$56 million / 7 miles / 2 circuits

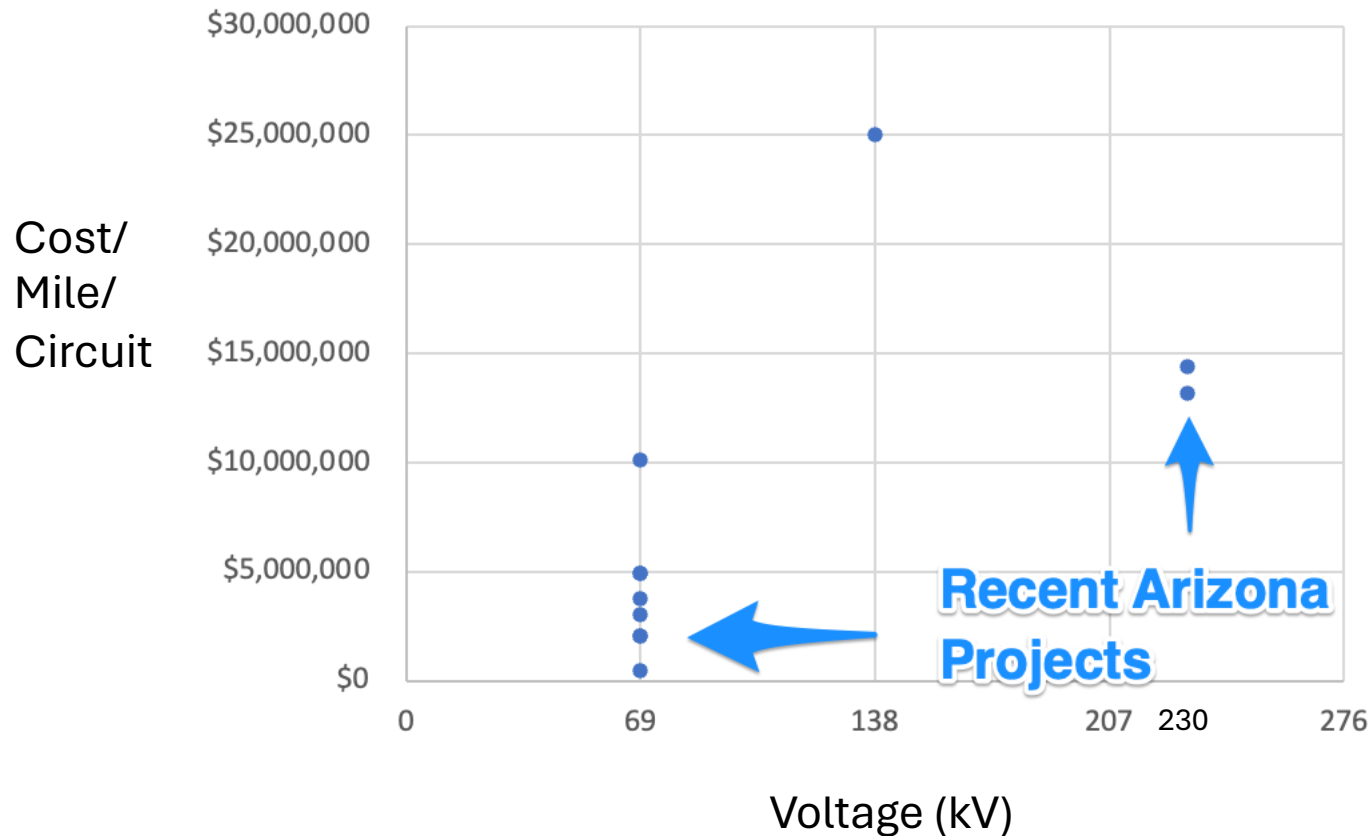
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\$4 million/mile for above ground 230kV

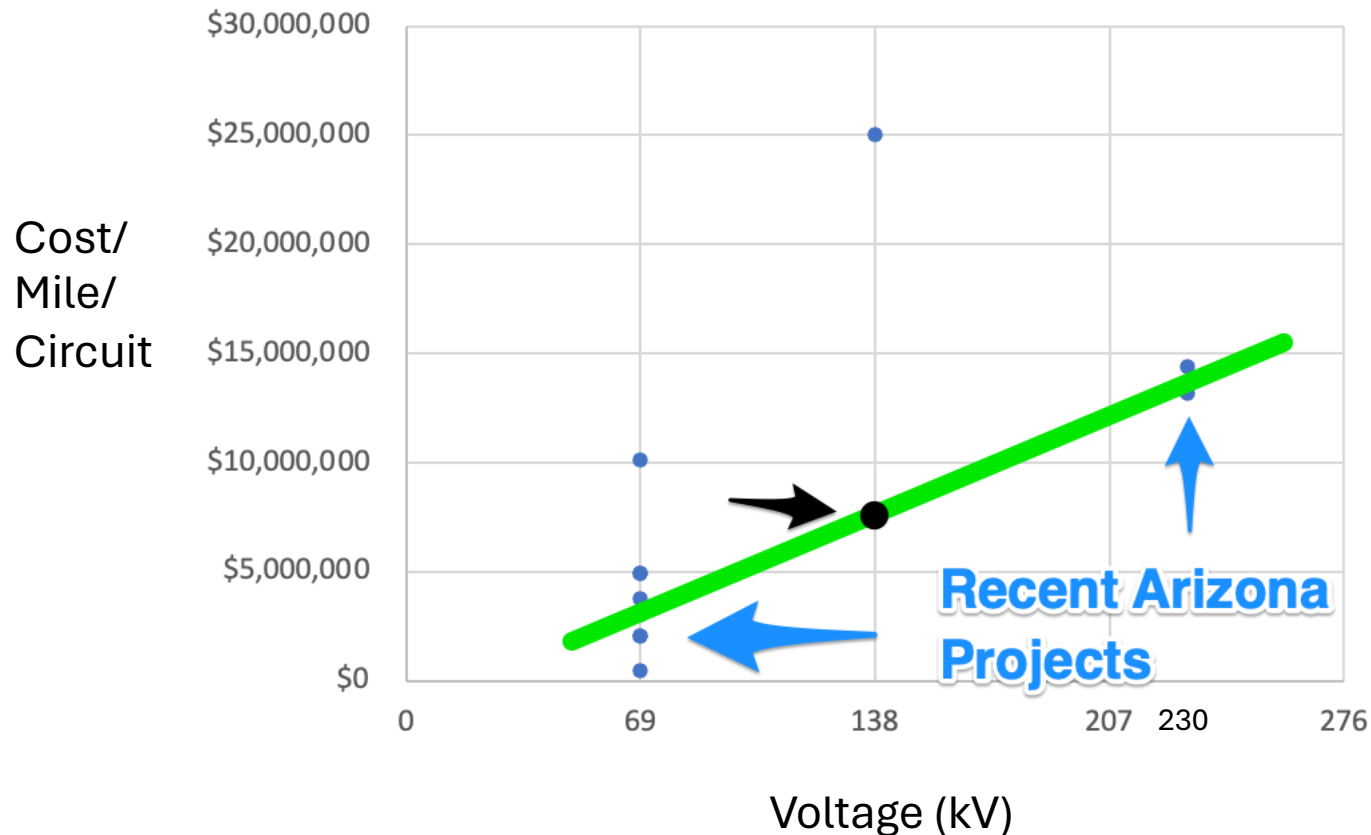
Case 198: SRP Chandler Project Map



Plot Chart of Recent Arizona Underground Projects

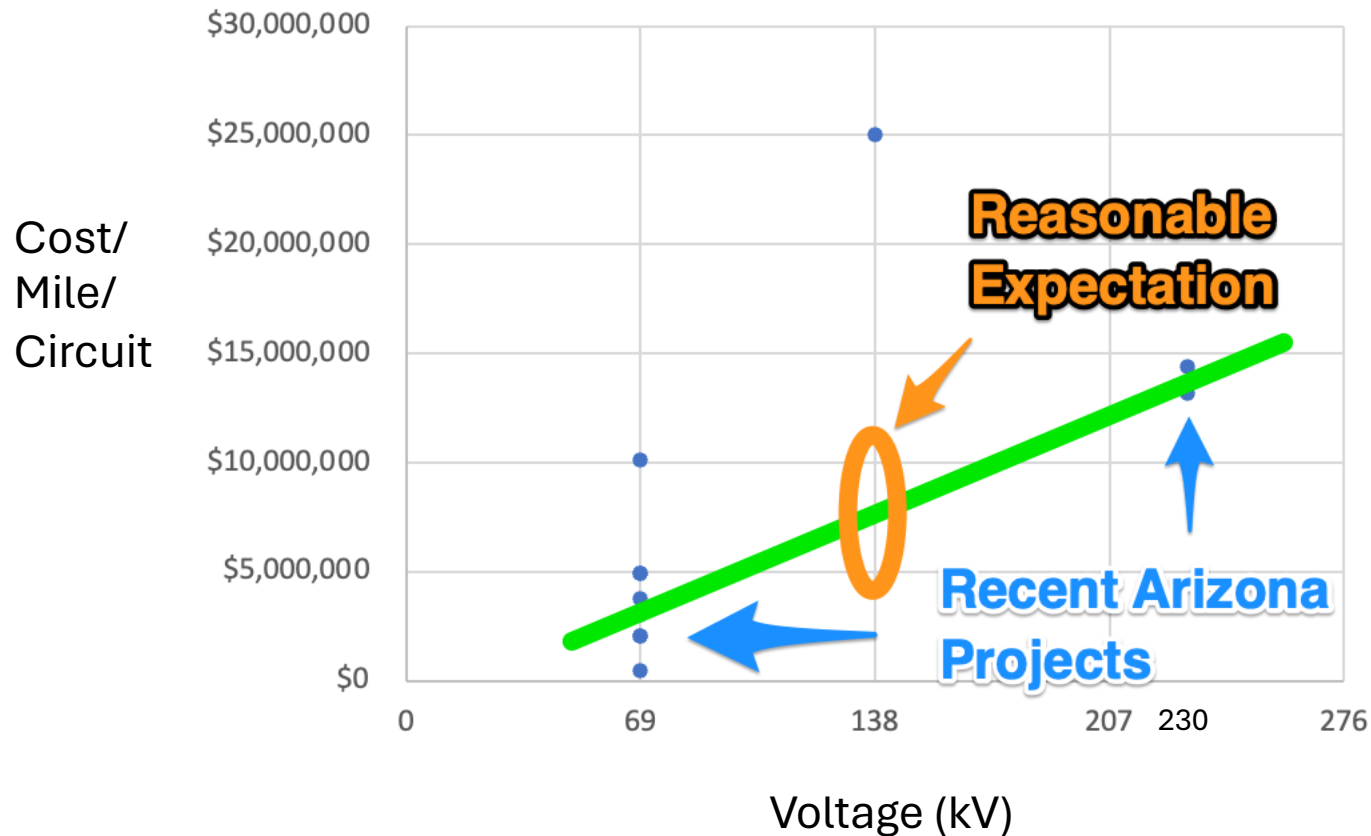


Plot Chart of Recent Arizona Underground Projects

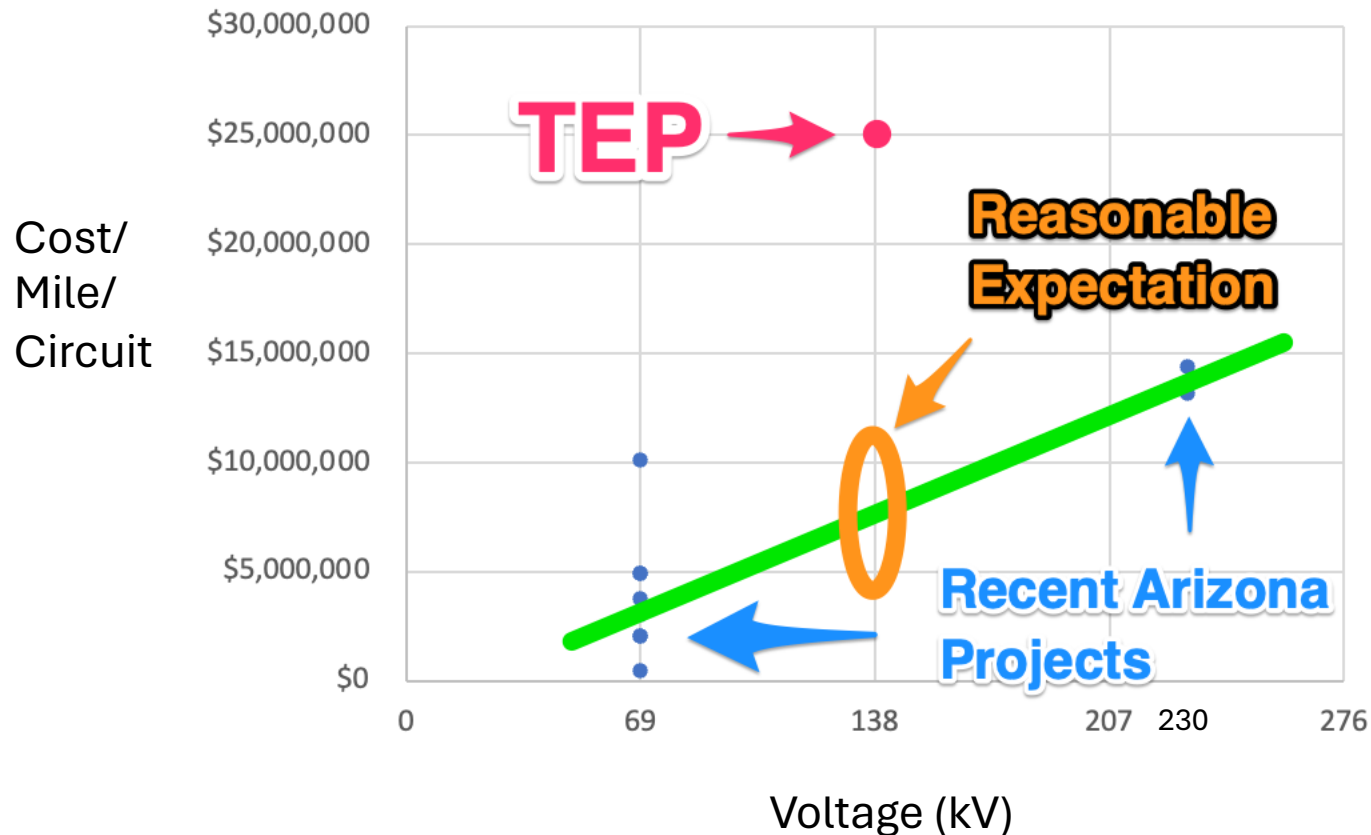


\$7.9m/mile mid-point between 69kV and 230kV

Plot Chart of Recent Arizona Underground Projects

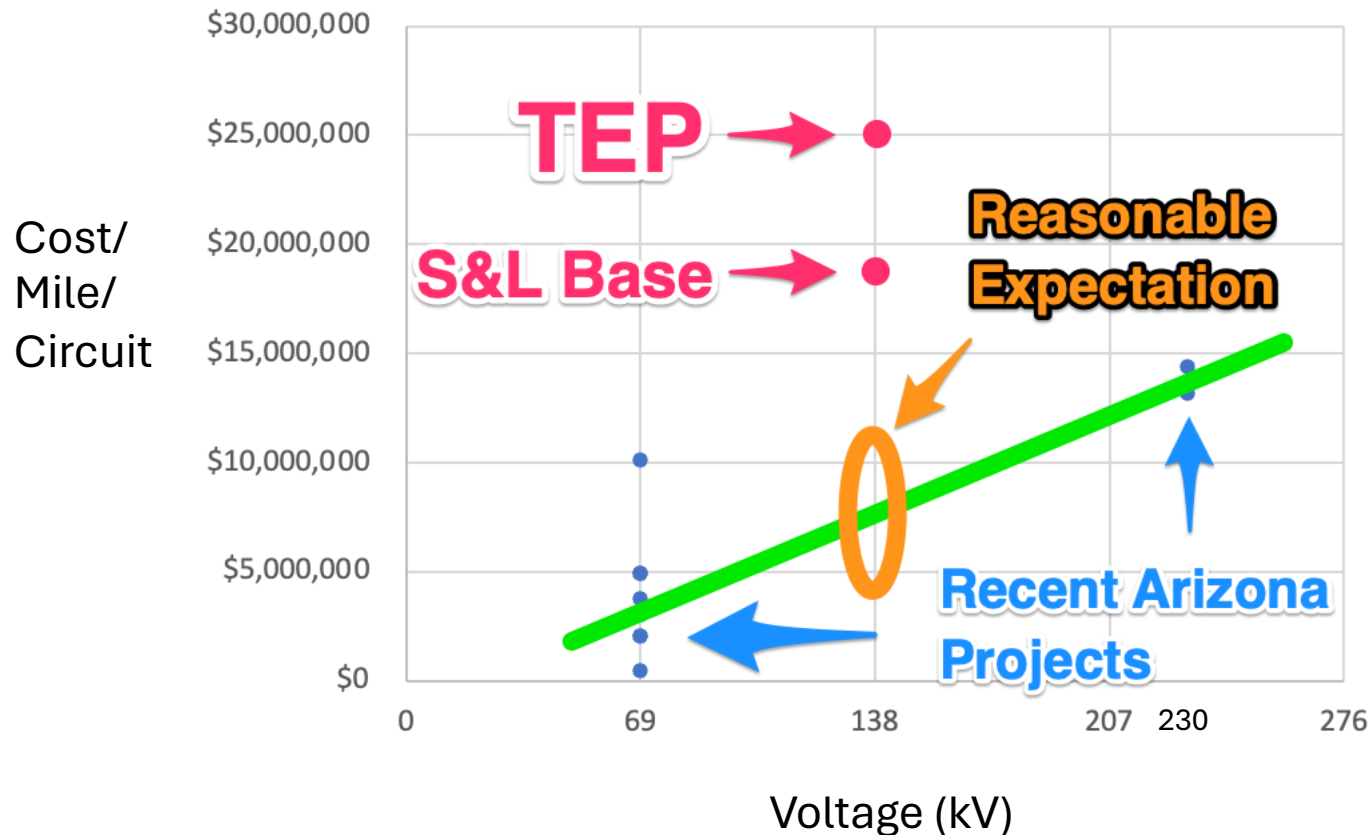


Plot Chart of Recent Arizona Underground Projects



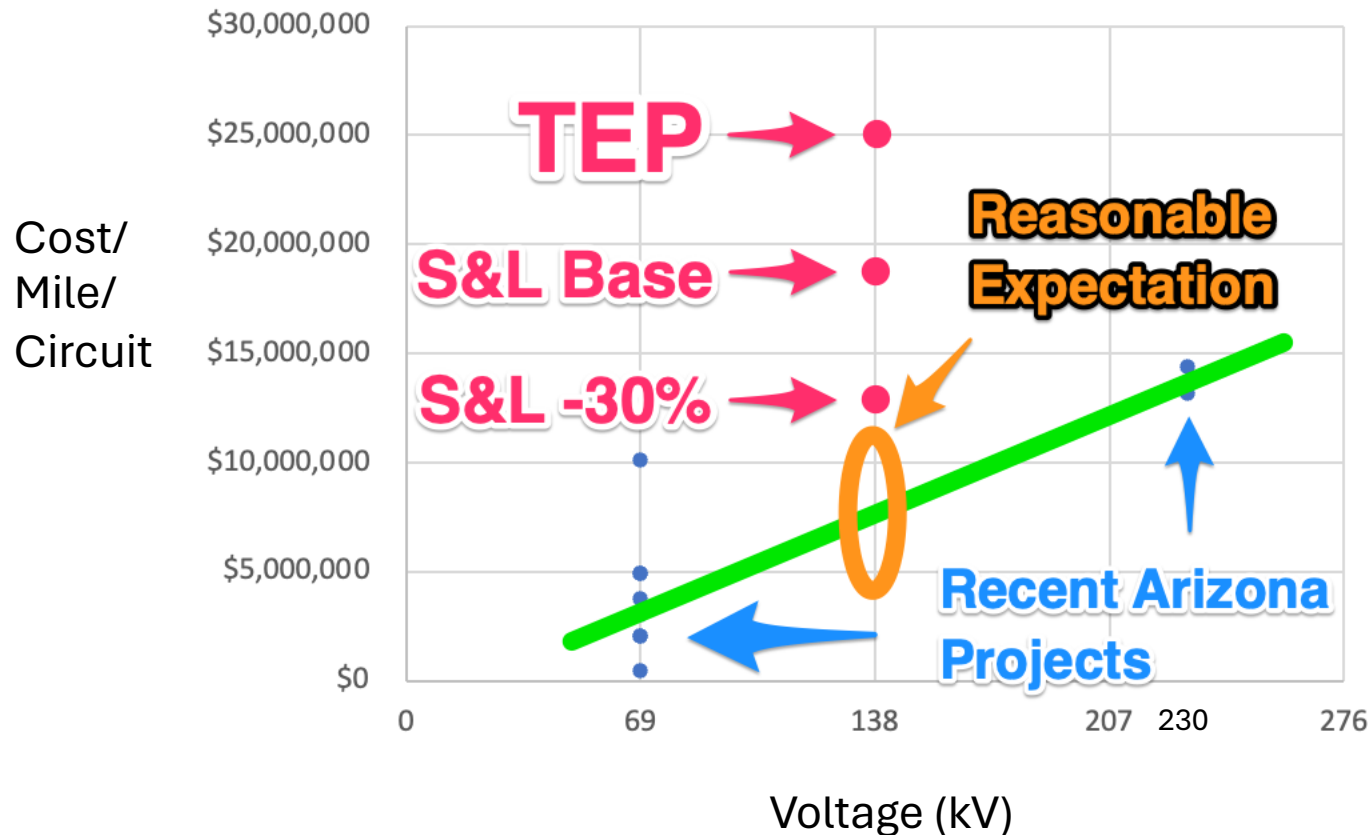
TEP application claims \$25m/mile.

Plot Chart of Recent Arizona Underground Projects



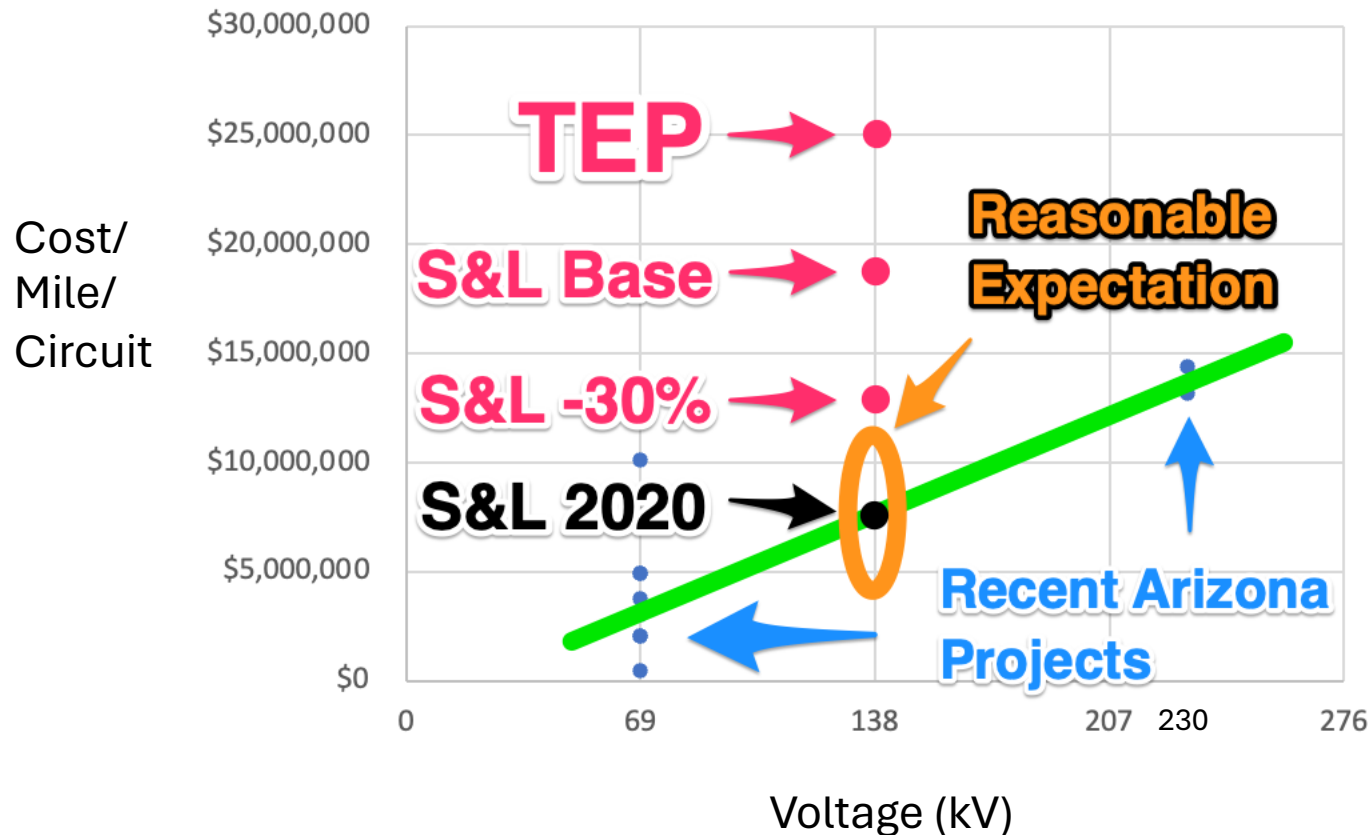
S&L 2024 Base \$17.8m/mile.

Plot Chart of Recent Arizona Underground Projects



S&L 2024 -30% \$12.5m/mile.

Plot Chart of Recent Arizona Underground Projects



In 2020, S&L estimated \$8.2m/mile.

TEP Argument 2

2. *“[It would cost TEP] \$25 million per mile for an underground line.”* p29

Incredibly unlikely.

TEP Argument 3

3. *“This extra cost is significant and would result in higher rates for all TEP customers if included in the rate base.”* p29

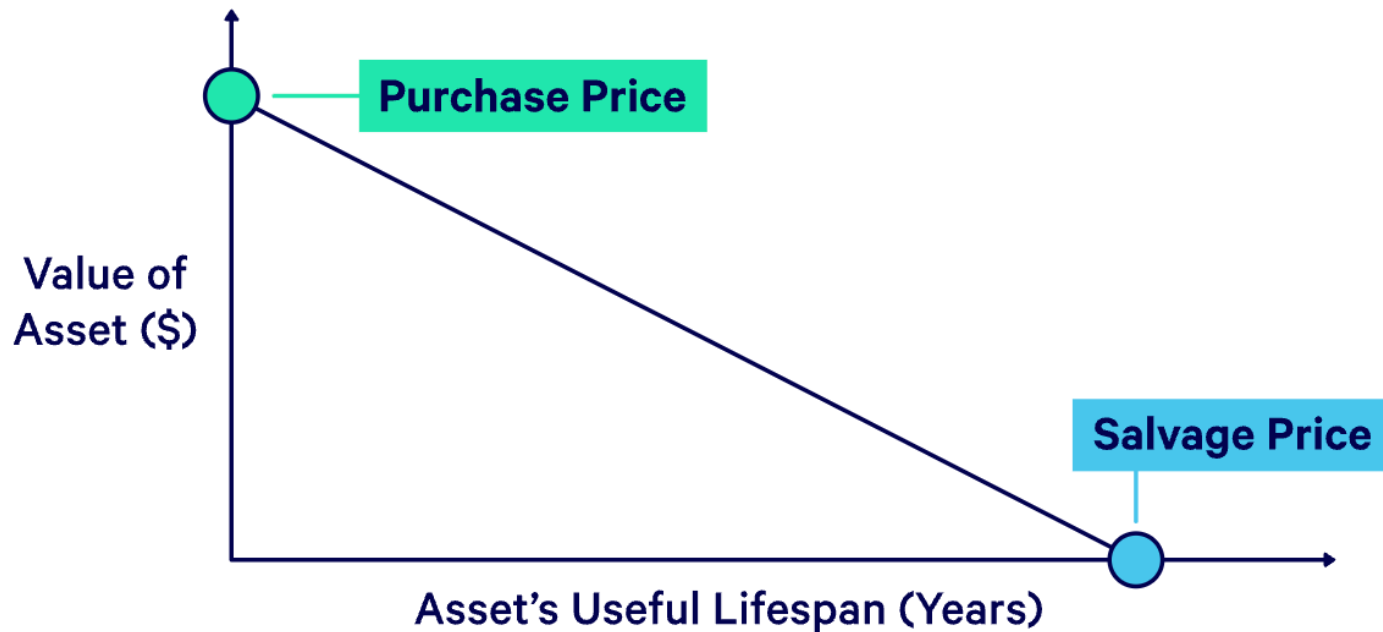
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Sargent & Lundy													
Rev	Date	Length (miles)	Base Cost /Mile (\$m)	UG Total Cost (\$m)	OH Total Cost (\$4.1m)	UG - OH (\$m)	Diff	UG/Mile -30% (\$m)	UG Total -30% (\$m)	UG - OH -30% (\$m)	Diff		
0	2/11/20	1.5	\$ 9.09	\$ 13.64	\$ 6.15	\$ 7.49	1.22x	\$ 6.37	\$ 9.55	\$ 3.40	0.55x		
1	9/28/20	1.5	\$ 8.24	\$ 12.37	\$ 6.15	\$ 6.22	1.01x	\$ 5.77	\$ 8.66	\$ 2.51	0.41x		
8	6/19/24	2.28	\$ 17.85	\$ 40.69	\$ 9.35	\$ 31.34	3.35x	\$ 12.49	\$ 28.48	\$ 19.14	2.05x		
8-1	6/19/24	1.8	\$ 16.85	\$ 30.33	\$ 7.38	\$ 22.95	3.11x	\$ 11.80	\$ 21.23	\$ 13.85	1.88x		
8-3	6/19/24	0.48	\$ 21.58	\$ 10.36	\$ 1.97	\$ 8.39	4.26x	\$ 15.11	\$ 7.25	\$ 5.28	2.68x		
7-5	9/16/22	0.80	\$ 14.46	\$ 11.63	\$ 3.30	\$ 8.33	2.53x	\$ 10.12	\$ 8.14	\$ 4.84	1.47x		
7-6	9/16/22	0.83	\$ 15.33	\$ 12.80	\$ 3.42	\$ 9.38	2.74x	\$ 10.73	\$ 8.96	\$ 5.54	1.62x		

\$19.1m total extra cost.
This is a 2x cost differential.

Cost to Ratepayers: Depreciation

Straight-Line Depreciation



Depreciation rates can decrease over time.

B6-3

10th International Conference on Insulated Power Cables

B6-3

Can Cables Last 100 Years?

CONCLUSION

The notion of 40-year cable life is a widely held belief in the industry. The concept of this life expectancy, however, is a statistical probability, and there are numerous utilities observing cables lasting longer than the 40-year mark. To determine the 100 year life potential, an investigation into retained AC breakdown strength curves was used to demonstrate cables aged in the field exhibit withstand levels well in excess of service conditions and could potentially survive for an undetermined time, provided they see moderate operating conditions and discrete defects are removed. After extensive field work and literature review, the authors have not be able to find any contradicting science to suggest cables cannot last 100 years or longer and by this paper welcome industry engagement in this discussion.

Jicable'19 - Paris - Versailles 23-27 June, 2019

1 / 5

Cost to Ratepayers: Underground Depreciation

Arizona Public Service Company

Attachment 8 - Depreciation Rates

Plant Account	Depreciation Rates
352.01 - Structures	1.84%
353 - Station Equipment	2.14%
354 - Towers and Fixtures	1.34%
355.01 - Poles and Fixtures - Wood	2.21%
355.02 - Poles and Fixtures - Steel	2.10%
356 - Overhead Conductors and Devices	1.87%
357 - Underground Conduit	1.55%
358 - Underground Conductors and Devices	1.33%

Let's assume 1.55% per year.

Cost to Ratepayers: TEP 2023 Revenues

DISAGGREGATION OF REVENUES

The following table presents the disaggregation of TEP's Operating Revenues on the Consolidated Statements of Income by type of service:

(in millions)	Years Ended December 31,		
	2023	2022	2021
Retail	\$ 1,283	\$ 1,140	\$ 1,088
Wholesale ⁽¹⁾	364	456	278
Other Services	124	104	114
Revenues from Contracts with Customers	1,771	1,700	1,480
Alternative Revenues	38	28	12
Other	66	80	101
Total Operating Revenues	\$ 1,875	\$ 1,808	\$ 1,593

⁽¹⁾ The decrease in 2023 was primarily due to decreases in volume and market prices.

TEP collected \$1.283 billion from ratepayers.

Cost to Ratepayers: TEP 2024-28 Capex

Our forecasted capital expenditures presented below exclude amounts for AFUDC equity and other non-cash items:

(in millions)	Years Ended December 31,				
	2024	2025	2026	2027	2028
Generation Facilities:					
New Energy Resources ⁽¹⁾	\$ 188	\$ 185	\$ 283	\$ 550	\$ 306
Other Generation Facilities ⁽²⁾	33	40	22	60	34
Total Generation Facilities	221	225	305	610	340
Transmission and Distribution ⁽³⁾	409	258	238	237	267
General and Other ⁽⁴⁾	63	64	77	66	66
Total Capital Expenditures	\$ 693	\$ 547	\$ 620	\$ 913	\$ 673

**TEP projected to spend
\$3.45 billion from 2024-28.**

Cost to Ratepayers: What's the annualized cost?

$$\text{\$19,100,000} * 1.55\% = \text{\$296,050/year}$$

The cost increase to ratepayers **could be** up to \$296,050 per year.

Cost to Ratepayers: Is it significant to collections?

$$\begin{aligned} &\$296,050 \text{ (Cost)} / \$1,283,000,000 \text{ (Collections)} \\ &= 0.00023 \end{aligned}$$

This is 23 hundred thousandths of collections

This is insignificant.

On a \$100 invoice, it might add 2.3 cents.

TEP Application, page 20

Importantly, this upgrade will allow for the removal of up to eight 46 kV substations and 19 miles of 46 kV lines¹, ultimately resulting in a net reduction in substations and miles of overhead powerlines in Midtown Tucson.

- How much is the 19 miles and 8 substations currently costing ratepayers?

Cost to Ratepayers: Is it significant to capital expenditures?

$$\begin{aligned} &\$19,100,000 \text{ (Cost)} / \$3,450,000,000 \text{ (Capex)} \\ &= 0.0055 \end{aligned}$$

This is 5.5 thousandths of projected capital expenditures.

This is also insignificant.

Undergrounding can achieve lower operation, maintenance, and repair costs.

Energy Policy Institute's Eighth Annual Energy Policy Research Conference

Underground power lines can be the least cost option when study biases are corrected

Ephram Glass, Victor Glass*

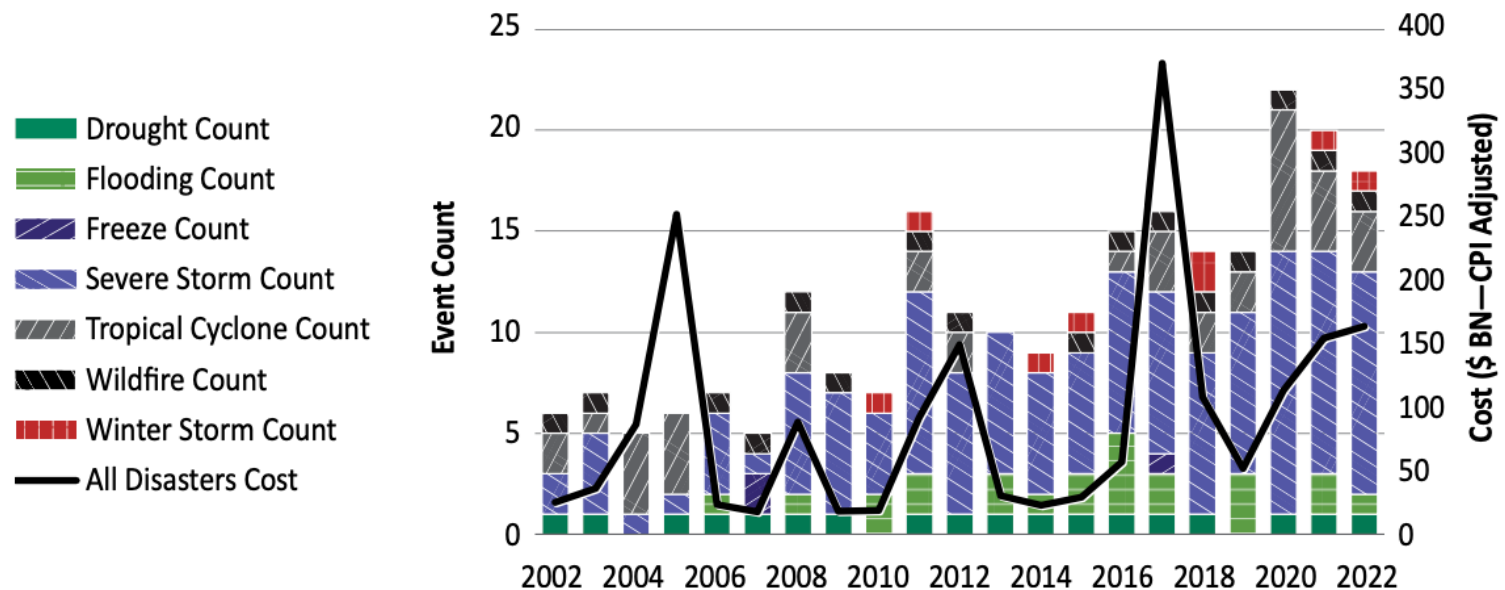
Rutgers Business School, 1 Washington Park, Newark 07102, United States

A B S T R A C T

After nearly every major storm that causes widespread power outages, there are calls for undergrounding power lines in the United States. It is often pointed out that most other developed countries have significantly better power reliability due to the prevalence of underground networks. However, many studies of U.S. electric utilities have concluded that a broad undergrounding mandate would be too expensive and undergrounding can only be justified when factoring customers' willingness to pay more for underground lines. We show that misleading national comparisons and improperly conducted U.S. studies have led to false conclusions about the economic efficiency of undergrounding power lines. Once data are standardized and properly disaggregated, the case for undergrounding improves significantly. We offer a basic methodology for conducting more accurate power line studies.

Undergrounding can achieve lower operation, maintenance, and repair costs.

FIGURE 1. Severe Weather Events Costing More Than US\$1 billion



Source: NOAA National Centers for Environmental Information (NCEI), "Billion-Dollar Weather and Climate Disasters (2022)."¹

1 <https://www.ncei.noaa.gov/access/billions/>

Undergrounding can achieve lower operation, maintenance, and repair costs.

Exhibit 2.3

“Strategic” Undergrounding Programs

Programs highlighted on map and where IOU, Co-Op, or municipality has published targeted mileage in table.



Strategic Undergrounding Programs		
Utility	Program Miles	
PG&E	10,000	
FPL	~ 5,000	
Dominion Energy	4,000	
WEC Energy Group	2,200	
TECO	~ 1,000	
PECO	1,000	
pepco	150	
Duke, FL	~ 500	
Ameren	400	
SDGE	~150 per year	
Georgia Power	~100 per year	
AL Power	~50 per year	
San Diego, CA	1,500	
Anaheim, CA	240	
Fort Collins, CO	99% Complete	
Austin, TX	Study	

Source: Continuum proprietary research, compiled from public sources.

EIA Data: Worsening reliability from storms

Table 11.1 Reliability Metrics of U.S. Distribution System

Year	IEEE								
	All Events (With Major Event Days)			Without Major Event Days			Loss of Supply Removed		
	SAIDI (minutes per year)	SAIFI (times per year)	CAIDI (minutes per interruption)	SAIDI (minutes per year)	SAIFI (times per year)	CAIDI (minutes per interruption)	SAIDI (minutes per year)	SAIFI (times per year)	CAIDI (minutes per interruption)
2013	227.2	1.187	191.5	111.9	0.994	112.6	225.5	1.113	202.6
2014	236.2	1.257	188	114.2	1.038	110	244.8	1.202	203.7
2015	209	1.275	163.9	117	1.073	109.1	198.2	1.163	170.4
2016	268.4	1.327	202.2	119.8	1.082	110.7	257	1.23	209
2017	505.9	1.42	356.2	117	1.023	114.3	489.6	1.254	390.6
2018	349.2	1.34	260.5	121.4	1.051	115.5	338.5	1.193	283.8
2019	295.5	1.332	221.8	122.2	1.04	117.5	289.1	1.189	243
2020	456.1	1.385	329.3	116	1.013	114.5	460.5	1.238	371.9
2021	475.8	1.436	331.2	125.7	1.039	120.9	404.5	1.294	312.6
2022	333	1.426	233.5	131.1	1.09	120.2	324.7	1.315	246.9

TEP Cost Claim 3

3. *“This extra cost is significant and would result in higher rates for all TEP customers if included in rate base.” p29*

Extra cost is insignificant and may not result in higher relative rates.

Extra cost has other benefits to ratepayers that may far exceed that extra cost.

Statutory Factors 1, 5, 6, and 8

40-360.06. Factors to be considered in issuing a certificate of environmental compatibility.

A. The committee may approve or deny an application and may impose reasonable conditions on the issuance of a certificate of environmental compatibility and in so doing shall consider the following factors as a basis for its action with respect to the suitability of either plant or transmission line siting plans:

1. Existing plans of this state, local government and private entities for other developments at or in the vicinity of the proposed site.
5. Existing scenic areas, historic sites and structures or archaeological sites at or in the vicinity of the proposed site.
6. The total environment of the area.
8. The estimated cost of the facilities and site as proposed by the applicant and the estimated cost of the facilities and site as recommended by the committee, recognizing that any significant increase in costs represents a potential increase in the cost of electric energy to the customers or the applicant.

Statutory Factor 6

Tucson City Council approves 20-story tower at Speedway and Campbell

Joe Ferguson

Jun 20, 2018

Apartments, retail development coming to edge of UArizona campus

Tucson City Council approved rezoning at 6th St & Campbell Ave. after neighborhood negotiations

A new 10-story student housing complex is going up in Tucson

Gabriela Rico

May 16, 2024

Statutory Factor Score: 3-0 Against Project

Factor	Description	Favors Project
1	Existing City plans	No
2	Wildlife & Plants	--
3	Noise and interference	--
4	Recreation	--
5	Existing scenic and historic	No
6	Total environment	No
7	Technical practicability	--
8	Cost	--
9	Federal & State Laws	--

CoT laws are not “unreasonably restrictive” and compliance therewith is “feasible.”

40-360.06. Factors to be considered in issuing a certificate of environmental compatibility.

D. Any certificate granted by the committee shall be conditioned on compliance by the applicant with all applicable ordinances, master plans and regulations of the state, a county or an incorporated city or town, except that the committee may grant a certificate notwithstanding any such ordinance, master plan or regulation, exclusive of franchises, if the committee finds as a fact that compliance with such ordinance, master plan or regulation is unreasonably restrictive and compliance therewith is not feasible in view of technology available. When it becomes apparent to the chairman of the committee or to the hearing officer that an issue exists with respect to whether such an ordinance, master plan or regulation is unreasonably restrictive and compliance therewith is not feasible in view of technology available, the chairman or hearing officer shall promptly serve notice of such fact by certified mail on the chief executive officer of the area of jurisdiction affected and, notwithstanding any provision of this article to the contrary, shall make such area of jurisdiction a party to the proceedings on its request and shall give it an opportunity to respond on such issue.

Undergrounding is a “just and reasonable” (prudent) expense and recoverable from ratepayers because:

1. The line siting factors favor protecting the area; and,
2. The City of Tucson’s laws require undergrounding to protect the area; and,
3. The existing case law, and now this recently decided case, allow cities to mandate undergrounding at utility expense; and,
4. Existing ACC precedent and policies allow utilities to recover the cost of undergrounding, especially where required by law or line siting factors; and,
5. The costs are relatively insignificant to TEP or ratepayers; and,
6. Studies show that undergrounding lines can increase reliability and save money over their lifetime; and,
7. Continuing to fight is wasteful and will result in more expense than following the law costs, and seems unlikely to result in success; and,
8. ...surely more.

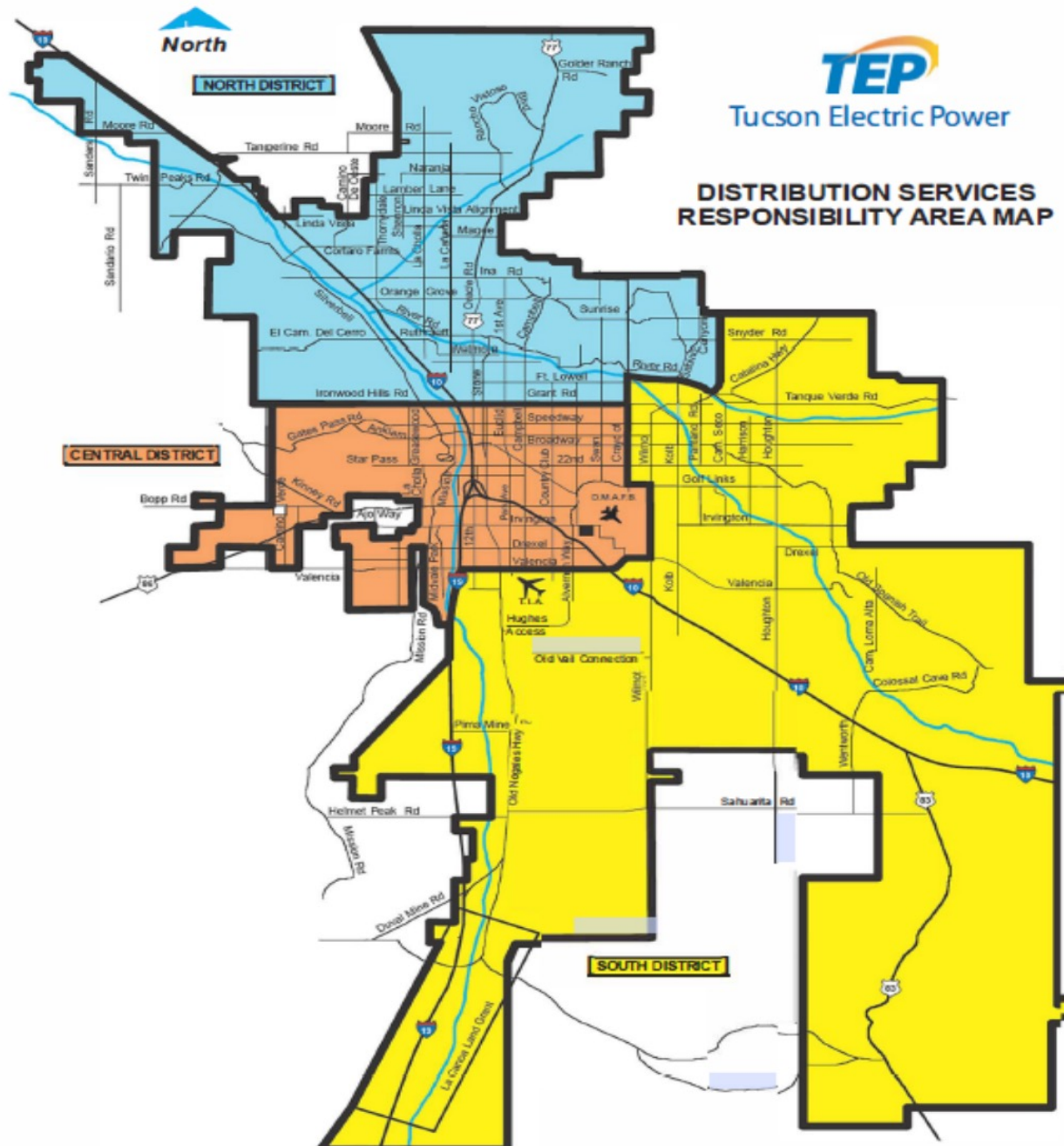
**You can approve Route 1A without
superseding local laws to save time.**

Statutory Factor Score: 3-0 Against Project

Factor	Description	Favors Project
1	Existing City plans	No
2	Wildlife & Plants	--
3	Noise and interference	--
4	Recreation	--
5	Existing scenic and historic	No
6	Total environment	No
7	Technical practicability	--
8	Cost	--
9	Federal & State Laws	--

Underground Arizona

undergroundarizona.org

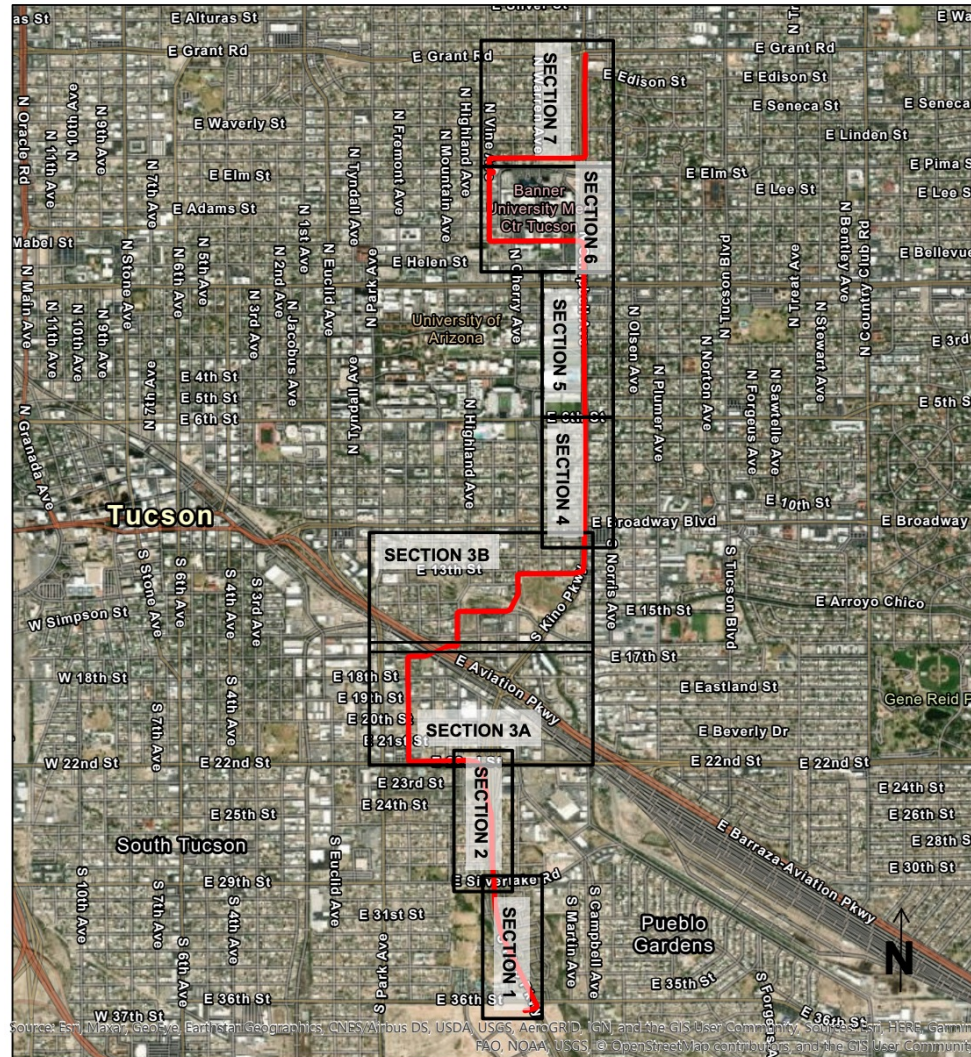


Sargent & Lundy Estimates

Sargent & Lundy												
Rev	Date	Length (miles)	Base Cost /Mile (\$m)	UG Total Cost (\$m)	OH Total Cost (\$2.8m)	UG - OH (\$m)	Diff	UG Total -30% (\$m)	UG - OH -30% (\$m)	Diff		
0	2/11/20	1.5	\$ 9.09	\$ 13.64	\$ 4.20	\$ 9.44	2.25x	\$ 9.55	\$ 5.35	1.27x		
1	9/28/20	1.5	\$ 8.24	\$ 12.37	\$ 4.20	\$ 8.17	1.94x	\$ 8.66	\$ 4.46	1.06x		
8	6/19/24	2.28	\$ 17.85	\$ 40.69	\$ 6.38	\$ 34.31	5.37x	\$ 28.48	\$ 22.10	3.46x		
8-1	6/19/24	1.8	\$ 16.85	\$ 30.33	\$ 5.04	\$ 25.29	5.02x	\$ 21.23	\$ 16.19	3.21x		
8-3	6/19/24	0.48	\$ 21.58	\$ 10.36	\$ 1.34	\$ 9.01	6.71x	\$ 7.25	\$ 5.91	4.39x		
7-5	9/16/22	0.80	\$ 14.46	\$ 11.63	\$ 2.25	\$ 9.38	4.16x	\$ 8.14	\$ 5.89	2.61x		
7-6	9/16/22	0.83	\$ 15.33	\$ 12.80	\$ 2.34	\$ 10.46	4.48x	\$ 8.96	\$ 6.62	2.83x		

How did the same routes increase 50% in 2 years?

Sargent & Lundy Section Map



Private Property Damage Claim Risk per Mile

Private Property Damage Risk per Mile in Millions

Damage Corridor Width (ft)	Private Real Estate Value* (\$m)	-2%	-5%	-10%	-15%	-20%
600	\$ 79.2	\$ (1.6)	\$ (4.0)	\$ (7.9)	\$ (11.9)	\$ (15.8)
1,000	\$ 132.0	\$ (2.6)	\$ (6.6)	\$ (13.2)	\$ (19.8)	\$ (26.4)
1,500	\$ 198.0	\$ (4.0)	\$ (9.9)	\$ (19.8)	\$ (29.7)	\$ (39.6)
2,000	\$ 264.0	\$ (5.3)	\$ (13.2)	\$ (26.4)	\$ (39.6)	\$ (52.8)

**Assumes the median residential home sales price is \$350,000 and the median lot size is 7,000ft² for a median sales price per residential lot ft² of \$50.00. Also assumes 50% of the property per mile is public property.*

Risk of millions of dollars in additional costs per mile that increases with density.

Copper Spot Price – 3 Years



Copper Spot Price – 20 Years

Intraday

1w

1m

6m

Ytd

1y

3y

5y

Max

Indicators ▼

Mountain-Chart ▼



LSC Case 198: What did APS pay?



Project Cost

Transmission Line Routes	Total Length	Right-of-Way Costs	Construction Costs	Total Costs
Proposed Route A	7.10 miles	\$8 million	\$23.8 million	\$31.8 million
Proposed Route E	2.10 miles	\$1.5 million	\$6.4 million	\$7.9 million
Proposed Route G	2.75 miles	\$2.3 million	\$9.5 million	\$11.8 million
Total	11.95 miles	\$11.8 million	\$39.7 million	\$51.5 million

\$51.5 million / 11.95 miles

=

\$4.3 million/mile for above ground 230kV

68

LSC Case 195: What did SRP pay?

- i. City will fund the cost difference between overhead and underground construction of the transmission lines (without consideration of the cost for moving utilities as discussed in subparagraph 2(b)(ii) below) through City's SRP Municipal Aesthetics Program allocated funds. SRP and City agree that such cost difference (net of the fair market value of the permanent easements) is Twelve Million Five Hundred Thousand Dollars (\$12,500,000).

Easements"). City and SRP agree City's grant of the Permanent Easements constitutes additional consideration for the Project and SRP's undergrounding of a portion of the Project and agree that the fair market value of the Permanent Easements is Four Million Five Hundred Thousand Dollars (\$4,500,000). The

$\$12.5 \text{ million} + \$4.5 \text{ million} = \$17 \text{ million}$

$\$17 \text{ million} / 2.65 \text{ miles}$

=

**SRP paid a \$6.4 million/mile differential
for underground 230kV**

LSC Case 195: What does underground 230kV cost?

SRP paid \$4 million/mile for above ground 230kV

SRP paid a \$6.4 million/mile differential
for underground 230kV

Thus, the total cost is \$14.4 million/mile to underground 230kV.

\$10.4 million / \$4 million - 1

=

1.6X Cost Differential

Nowhere close to 10-15X, as Mr. Heim testified.

LSC Case 198: What is the cost differential?

APS paid \$4.3million/mile for above ground 230kV

SRP paid \$6.4 million/mile differential
for underground 230kV in case 195

Thus, the total cost is \$10.7 million/mile to underground 230kV.

$\$10.7 \text{ million} / \$4.3 \text{ million} - 1$

$=$

1.5X Cost Differential

Nowhere close to the high end of Mr. Wiley's testimony.

Case 169: ASU Adjacent Undergrounding

