



2023 – Integrated Resource Plan (IRP)

October 2, 2023

<https://www.tep.com/2023-irp/>





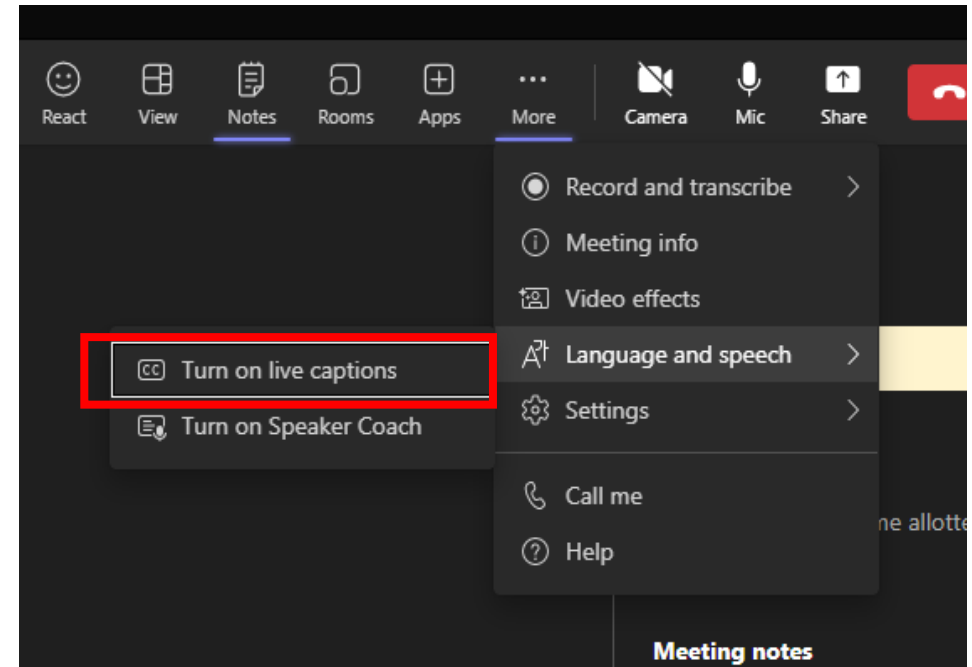
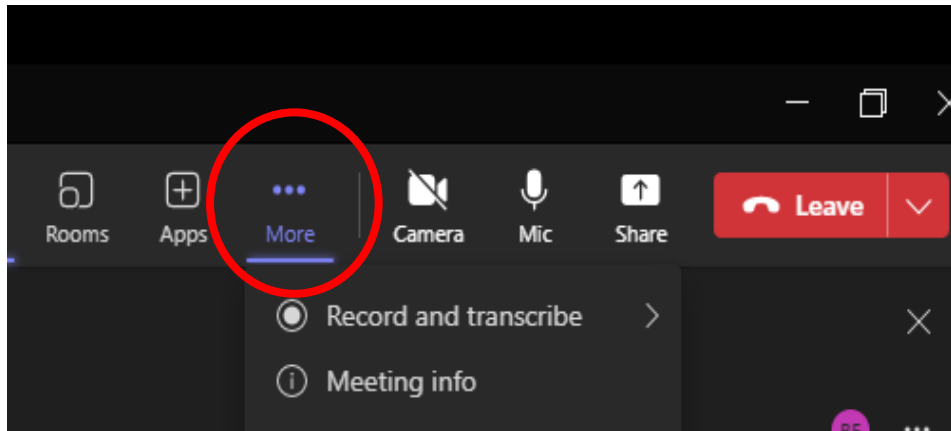
- **Overview of Today's Presentation**
 - Microsoft Teams and meeting protocols
 - Questions and answers
 - Public comment at the end of the presentation

- **Resource Planning Team**
 - Lauren Briggs, Director, Resource Planning
 - Jenny Crusenberry, Manager, Resource Planning & Hedging
 - Victor Aguirre, Manager, Resource Planning & Procurement
 - Lee Alter, Lead Resource Planner
 - Nonso Emordi, Lead Resource Planner
 - Ilse Morales Duarte, Supply Side Planner II
 - Brianna Robles, Supply Side Planner II
 - Joe Salkowski, Senior Director, Communications & Public Affairs
 - Mike Sheehan, Vice President, Fuels, Resource Planning & Wholesale Marketing



Logistics & Housekeeping

- This meeting has the live captioning option.
 - Click on the “More” menu option to expand.
 - Select “Language and Speech”.
 - Select the “Turn on live captions” option.

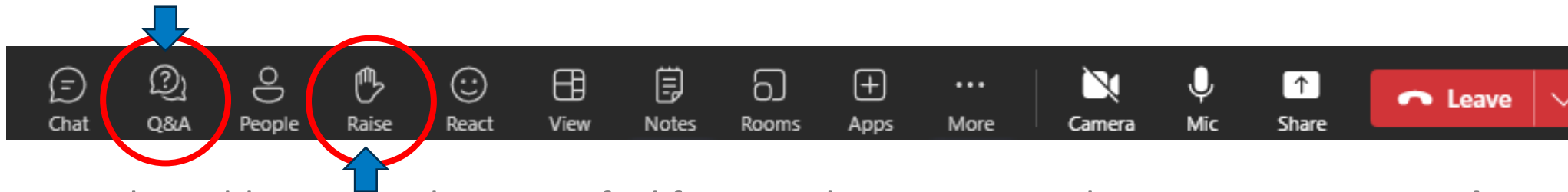


- Select “English” as the preferred language.



Logistics & Housekeeping

- Presenters will pause occasionally for clarifying questions.
- There will be a Public Feedback session at the end of the workshop. Please save in-depth comments and questions for this session.
- To ask questions during the presentation, use the Q&A board located on the menu at the top of the screen.



- During the Public Feedback session, feel free to ask questions or share your comments. **Please limit your time to 2 minutes.**
 - Raise your hand.
 - Unmute your mic when called upon.
 - Introduce yourself and organization (if applicable).
 - Ask your question/comment.

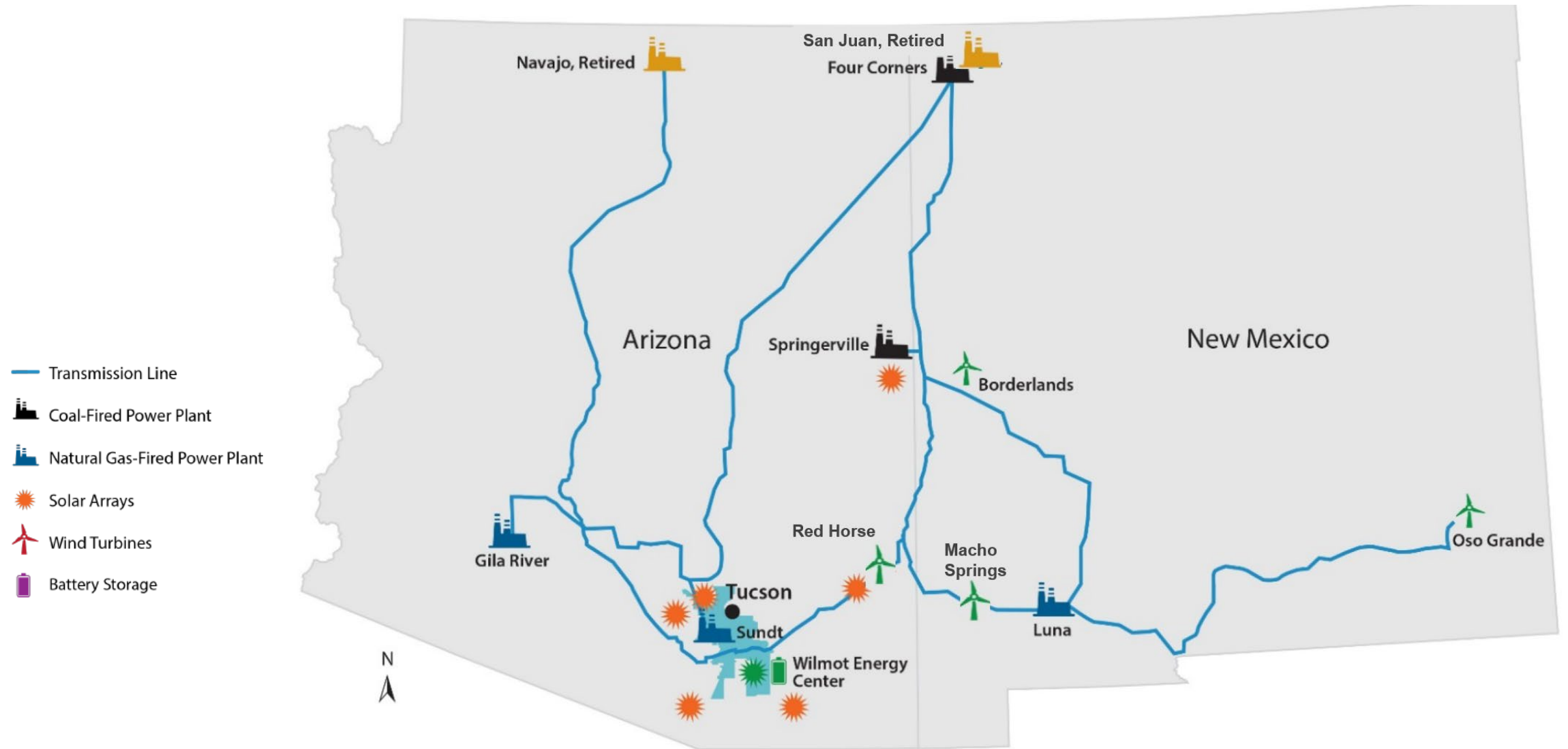


Agenda

- Introduction to TEP & UNSE
- 2020 Integrated Resource Plan with New Additions
- Key Inputs and Assumptions - Load, Market, Technology Costs
- Inflation Reduction Act (IRA) Assumptions
- TEP Portfolios
- Results
- Public Feedback



TEP System





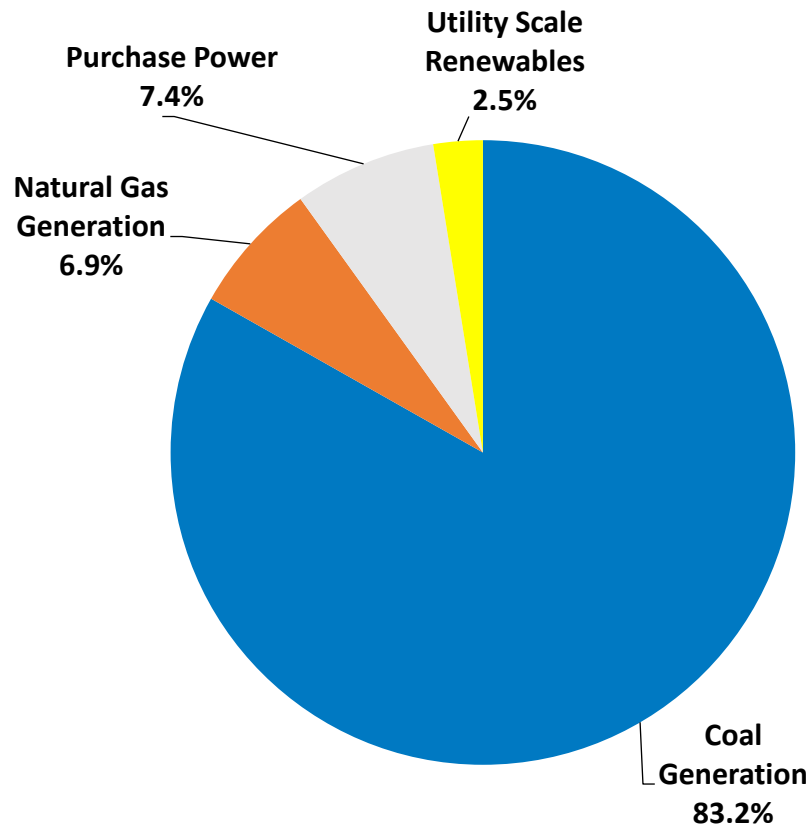
Integrated Resource Plan (IRP)

- **Planning Tool**
 - Serves as a long-term roadmap
 - Provides guidance in changing environment
 - Results in short-term action plans (3 to 5 years)
- **Criteria Driven**
 - Reliability
 - System Load (demand, sales & growth)
 - System Resources (thermal, renewables, and energy efficiency)
 - Strategic (minimize costs, tax credits, risk mitigation)
- **Policy**
 - Renewable Portfolio Standards
 - Energy Efficiency
 - Environmental and Conservation

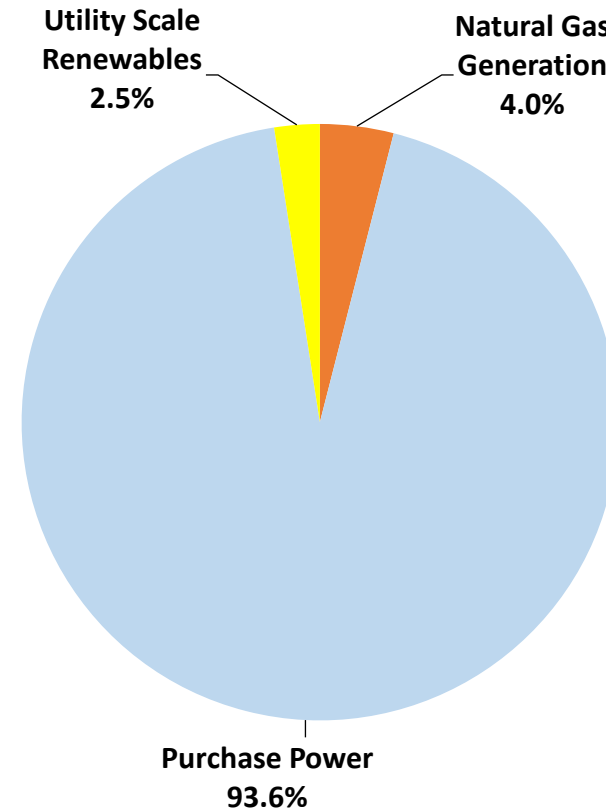


2012 Historical Portfolios (Energy)

2012
TEP Generation Portfolio



2012
UNSE Generation Portfolio



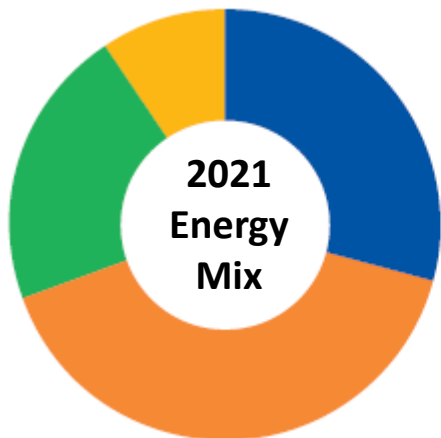


2021 Quick Facts



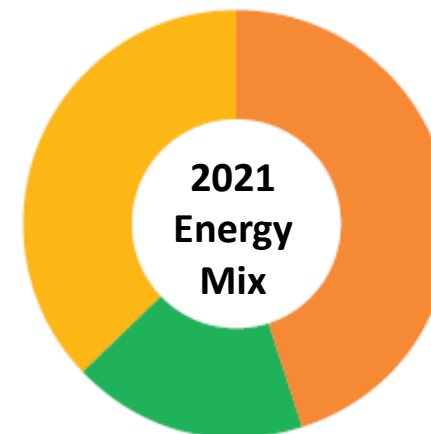
- 440,000 customers
- 1,100 MW average demand
- 2,400 MW peak demand
- 2,720 MW of dispatchable supply

- 100,000 customers
- 225 MW average demand
- 520 MW peak demand
- 290 MW of dispatchable supply



TEP

● Natural Gas	40.1%
● Coal	29.4%
● Renewable Energy	21.3%
● Purchased Power	9.2%



UniSource Electric

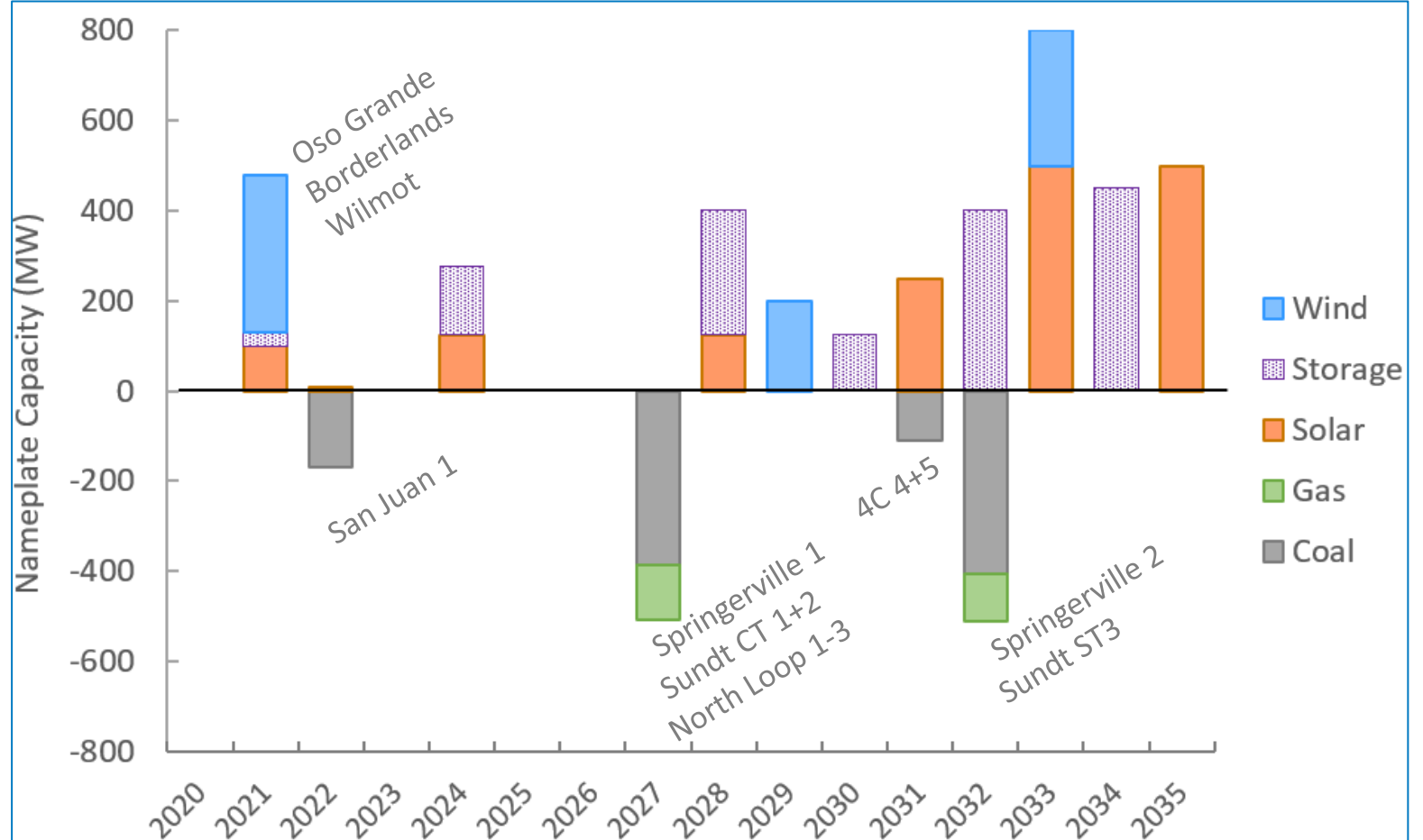
● Natural Gas	45.2%
● Purchased Power	37.0%
● Renewable Energy	17.8%



TEP 2020 Resource Plan

<u>Retirements</u>		<i>Currently In Service</i>
Gas	225 MW	1,820 MW
Coal	1,073 MW	1,073 MW
<u>Additions</u>		
Wind	850 MW	430 MW
Solar	1,610 MW	480 MW
Storage	1,430 MW	30 MW

Continuation of trends in distributed solar and energy efficiency

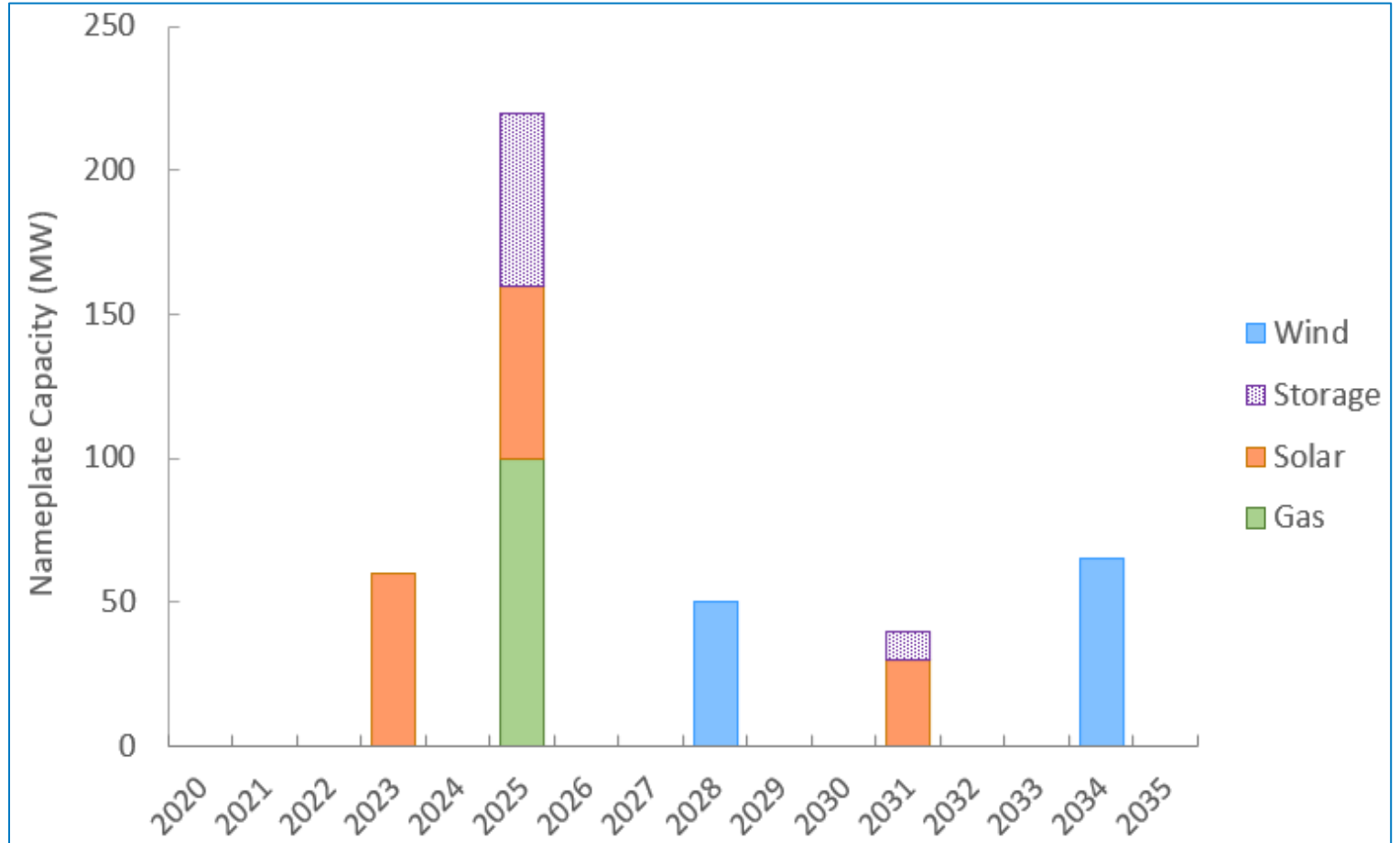




UNSE 2020 Resource Plan

<u>Retirements</u>		<i>Currently In Service</i>
None		
<u>Additions</u>		
Gas	100 MW	<i>280 MW</i>
Wind	115 MW	<i>10 MW</i>
Solar	150 MW	<i>95 MW</i>
Storage	70 MW	<i>0 MW</i>

Continuation of trends in distributed solar and energy efficiency





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2023 Integrated Resource Plan (IRP)

<https://www.tep.com/2023-irp/>





2023 Integrated Resource Planning Strategy



Resource Planning Strategic Framework

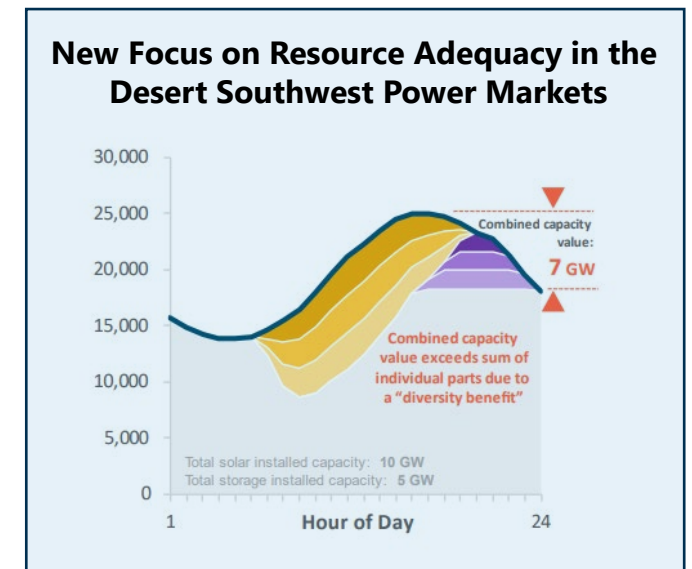
- **Reliability** – Capacity needed for summer peak demand and future load growth
- **Affordability** – Targeting lower cost, lower risk, high value portfolios
- **Sustainability** – Accelerate clean energy investments in comparison to the 2020 IRP
- **Diversity** – Resource diversity needed on a longer-term basis



Updates from the 2020 Integrated Resource Plan

The 2023 IRP improves upon the 2020 resource plan in several ways:

- Incorporation of the Inflation Reduction Act of 2022, which offers large incentives for electrification and tax credits that reduce the cost of renewables and energy storage resources
- Consideration of project development issues that have arisen since 2020, such as supply chain disruptions, increasingly-lengthy interconnection studies results and delays on acquisition of new equipment
- A deeper dive into emerging clean-energy technologies and the reliability challenges they pose as they displace more traditional fossil generation technologies and become an increasing larger portion of our resource portfolio in the near-term
- Reduction in wholesale power market options and the need to focus more on resource adequacy





2020 TEP IRP Action Plan Initiatives

Major initiatives executed on as part of our 2020 IRP Action Plans

Commissioned 480 MW of new wind and solar plus storage projects in 2021 and 2022

Retired 170 MW of coal capacity at the San Juan Generating Station in June 2022

Transitioned to seasonal operations at the Springerville Generating Station in 2023



Borderland Wind
Western New Mexico
99 MW



Oso Grande Wind
Southeast New Mexico
250 MW



Wilmot Energy Center
Tucson, Arizona
100 MW Solar and 30 MW Energy Storage



San Juan Generating Station
Farmington New Mexico
170 MW Coal Retired

2020 TEP IRP Action Plan Initiatives

Major initiatives executed on as part of our 2020 IRP Action Plans

Joined the real-time Western Energy Imbalance Market in May 2022

UNS has reduced its direct (Scope 1) CO₂ emissions by 32% since 2020

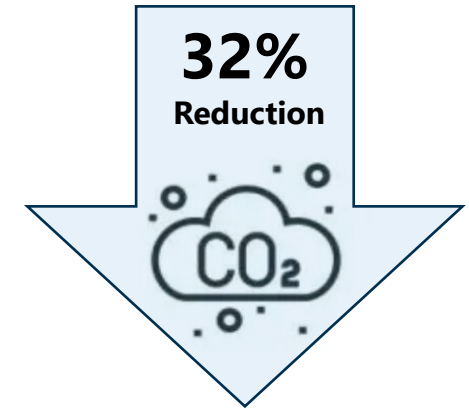
Resources executed on as part of our 2022 ASRFP

Issued the Company's first All-Source Request for Proposal for new energy and capacity resources in April 2022

Planned acquisition of 600 to 800 MW of new solar plus storage resources that are expected to be in service by the summer of 2026



Western Energy Imbalance Market
May 2022



Steady Progress on CO₂ Reductions Since 2020



2022 All-Source Request for Proposals
600 to 800 MW Solar + Energy Storage
by Summer 2026



Teams Question and Answers



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Portfolio Assumptions





Base Plan Assumptions

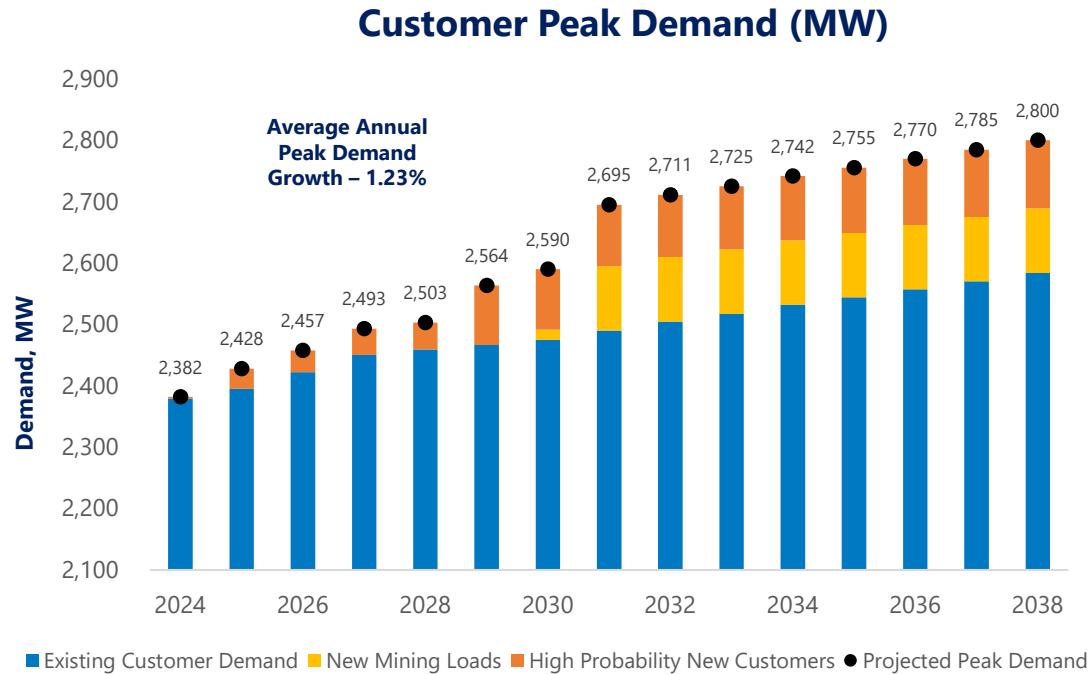
- Load growth assumptions include new economic development and mining load customer expansions
- Coal Unit Retirements¹
 - Springerville Unit 1 (387 MW) retires in the fall of 2027
 - Four Corners (110 MW) retires in July 2031
 - Springerville Unit 2 (390 MW) retires in the fall of 2032
- Sundt Unit 3 will retire in 2032 and Sundt Unit 4 will operate through the duration of the 15-year forecast
- All portfolios achieve 80% reductions in water usage, CO₂ and NO_x emissions by 2035
- All existing and future resources will be modeled to comply with the EPA's Regional Haze program, EPA's Good Neighbor Plan and EPA's recently proposed Greenhouse Gas Standards and Guidelines for Fossil Fuel-Fired Power Plants
- All portfolios target a minimum 16.5% planning reserve margin

Notes:

1. The 2023 coal unit retirements are based on the commitments made in the 2020 TEP Integrated Resource Plan. Moreover, Springerville Units 1 & 2 are limited to seasonal operations under all scenarios.

Customer Demand Forecast

Summer Peak Demands, MW



Customer Load Assumptions:

- Existing customer demand is expected to grow at 0.73% over the next five years.
- TEP's peak demand grows by 1.23% per year over the 15-year timeframe.

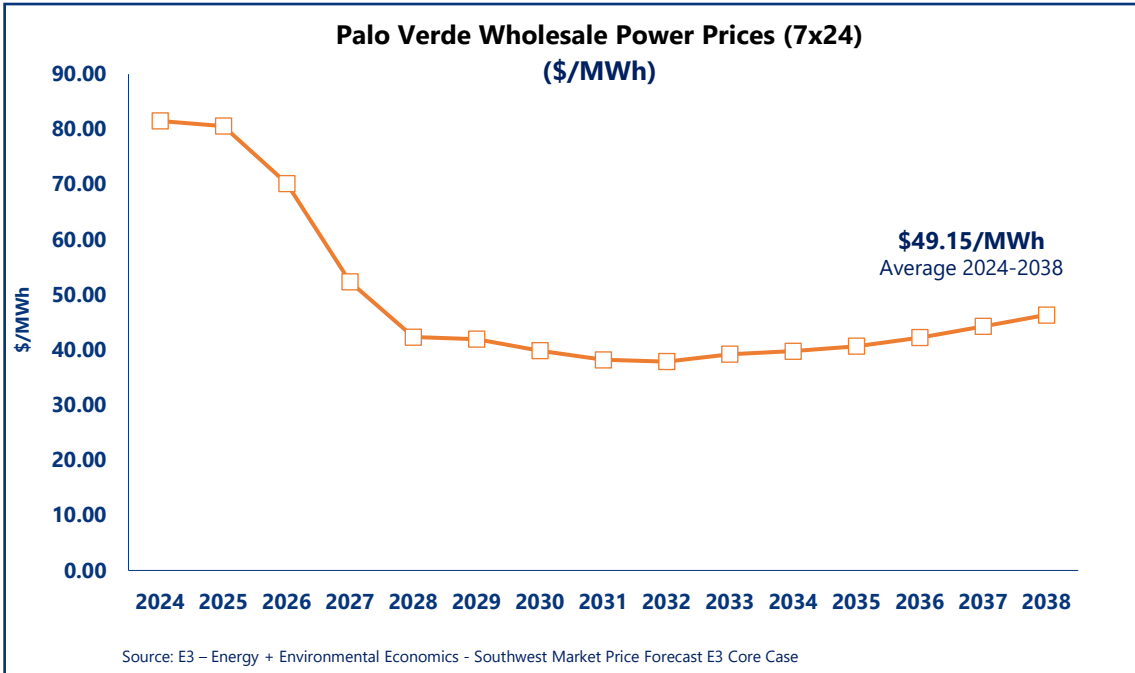
Customer Demand MW				
Year	Existing Customer Demand	High Probability New Customers	New Mining Loads	Projected Peak Demand
2024	2,379	3	0	2,382
2025	2,395	33	0	2,428
2026	2,422	35	0	2,457
2027	2,450	43	0	2,493
2028	2,459	43	0	2,503
2029	2,467	97	0	2,564
2030	2,475	99	17	2,590
2031	2,490	100	105	2,695
2032	2,505	102	105	2,711
2033	2,517	103	105	2,725
2034	2,532	105	105	2,742
2035	2,544	106	105	2,755
2036	2,557	108	105	2,770
2037	2,570	109	105	2,785
2038	2,584	111	105	2,800

New Customer Load Growth Assumptions:

- New high probability customers are based on current economic development discussions with large customers.
- New mining load is based on estimated production levels for Hudbay's Copper World Complex that starts in 2030 and ramps up to 105 MW by 2031.
- New customer assumptions based on data as of September 2023.

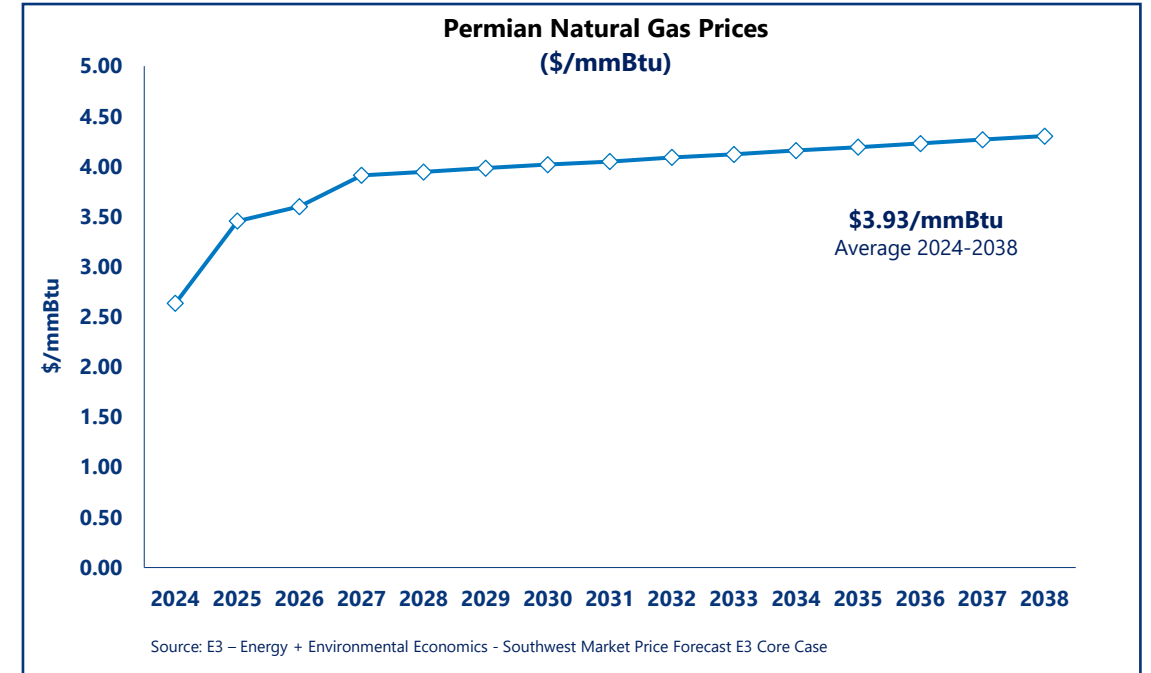
Forward Market Conditions

Wholesale Power & Natural Gas



Wholesale Power Price Assumptions:

- The 2023 IRP forecast assumes that average wholesale power prices decline as solar generation increases in the Desert Southwest region.
- Excess solar generation increases daily curtailments of solar resources which results in more negative prices during some hours of day.
- Price forecast derived Q1 2023.



Natural Gas Market Price Assumptions:

- Gas prices derived from monthly forwards in the near term and the 2022 Energy Information Administration (EIA) Annual Energy Outlook for the long term.
- Monthly SNL forwards for Permian used through 2026. Beyond 2026, the Desert Southwest Natural Gas forecast trends to EIA longer-term forecasts.
- Price forecast derived Q1 2023.



Inflation Reduction Act (Investment Tax Credit – ITC)

- All energy storage projects are assumed to qualify for the 30% investment tax credit

Future storage and renewable resources are assumed they will meet the prevailing wage and apprenticeship requirements under the IRA.

			Start of Construction						
			2006 to 2019	2020 to 2021	2022	2023 to 2033	The later of 2034 (or two years after applicable year ^a)	The later of 2035 (or three years after applicable year ^a)	The later of 2036 (or four years after applicable year ^a)
ITC	Full rate (if project meets labor requirements ^b)	Base Credit	30%	26%	30%	30%	22.5%	15%	0%
		Domestic Content Bonus				10%	7.5%	5%	0%
		Energy Community Bonus				10%	7.5%	5%	0%
	Base rate (if project does not meet labor requirements ^b)	Base Credit	30%	26%	6%	6%	4.5%	3%	0%
		Domestic Content Bonus				2%	1.5%	1%	0%
		Energy Community Bonus				2%	1.5%	1%	0%
	Low-income bonus (1.8 GW/yr cap)	<5 MW projects in LMI communities or Indian land				10%	10%	10%	10%
		Qualified low-income residential building project / Qualified low-income economic benefit project				20%	20%	20%	20%



Inflation Reduction Act (Production Tax Credit – PTC)

- All wind and solar projects are assumed to qualify for \$2.75¢/kWh production tax credits

Future storage and renewable resources are assumed they will meet the prevailing wage and apprenticeship requirements under the IRA.

			Start of Construction						
			2006 to 2019	2020 to 2021	2022	2023 to 2033	The later of 2034 (or two years after applicable year ^a)	The later of 2035 (or three years after applicable year ^a)	The later of 2036 (or four years after applicable year ^a)
PTC for 10 years (\$2022)	Full rate (if project meets labor requirements ^b)	Base Credit			2.75 ¢	2.75 ¢	2.0 ¢	1.3 ¢	0.0 ¢
		Domestic Content Bonus				0.3 ¢	0.2 ¢	0.1 ¢	0.0 ¢
		Energy Community Bonus				0.3 ¢	0.2 ¢	0.1 ¢	0.0 ¢
	Base rate (if project does not meet labor requirements ^b)	Base Credit			0.55 ¢	0.55 ¢	0.4 ¢	0.3 ¢	0.0 ¢
		Domestic Content Bonus				0.1 ¢	0.0 ¢	0.0 ¢	0.0 ¢
		Energy Community Bonus				0.1 ¢	0.0 ¢	0.1 ¢	0.0 ¢



Teams Question and Answers



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Preliminary TEP Portfolio Results





Three pathways emerge for TEP as potential resource portfolio outcomes...



Solar + Storage Portfolio

- 2,440 MW Renewables
- 2,180 MW Storage

**4,620 MW
New Generating & Storage
Resources**



Balanced Portfolio



- 1,890 MW Renewables
- 1,330 MW Storage
- 400 MW Natural Gas

**3,620 MW
New Generating & Storage
Resources**



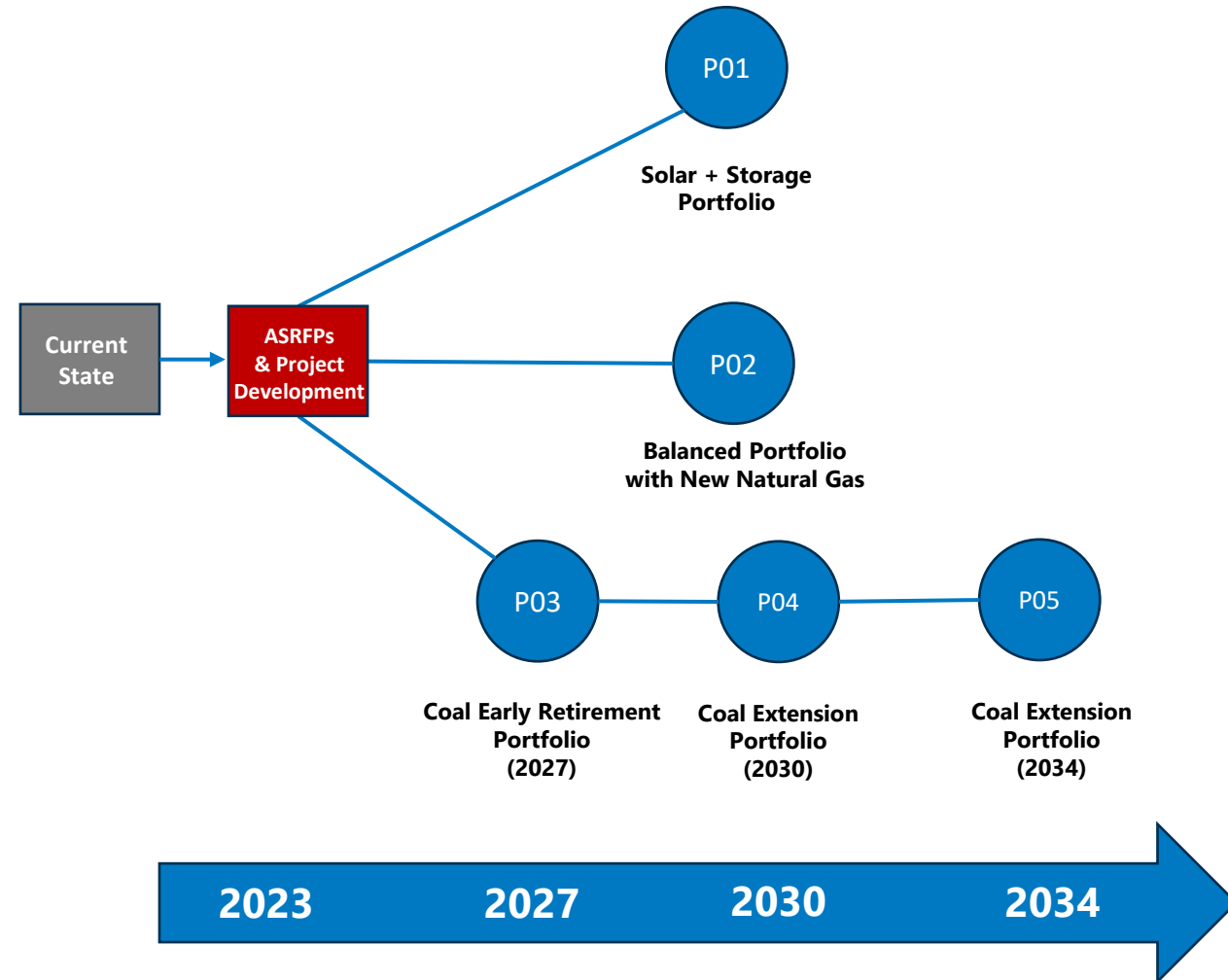
Coal Extension Portfolio

- 2,440 MW Renewables
- 2,180 MW Storage

**4,620 MW
New Generating & Storage
Resources**

Resource Contingency Planning

- **Regional market scarcity along with new economic development driving demand for near term firm capacity resources**
- **Planning with Uncertainty**
 - Generation interconnection study bottlenecks (FERC Order 2023)
 - Project denials (i.e., environmental, regulatory or zoning)
 - Limited natural gas pipeline transportation in Arizona
 - Lack of existing transmission capacity available throughout the region
 - Supply-chain and workforce constraints
- **All resource options need to be considered**



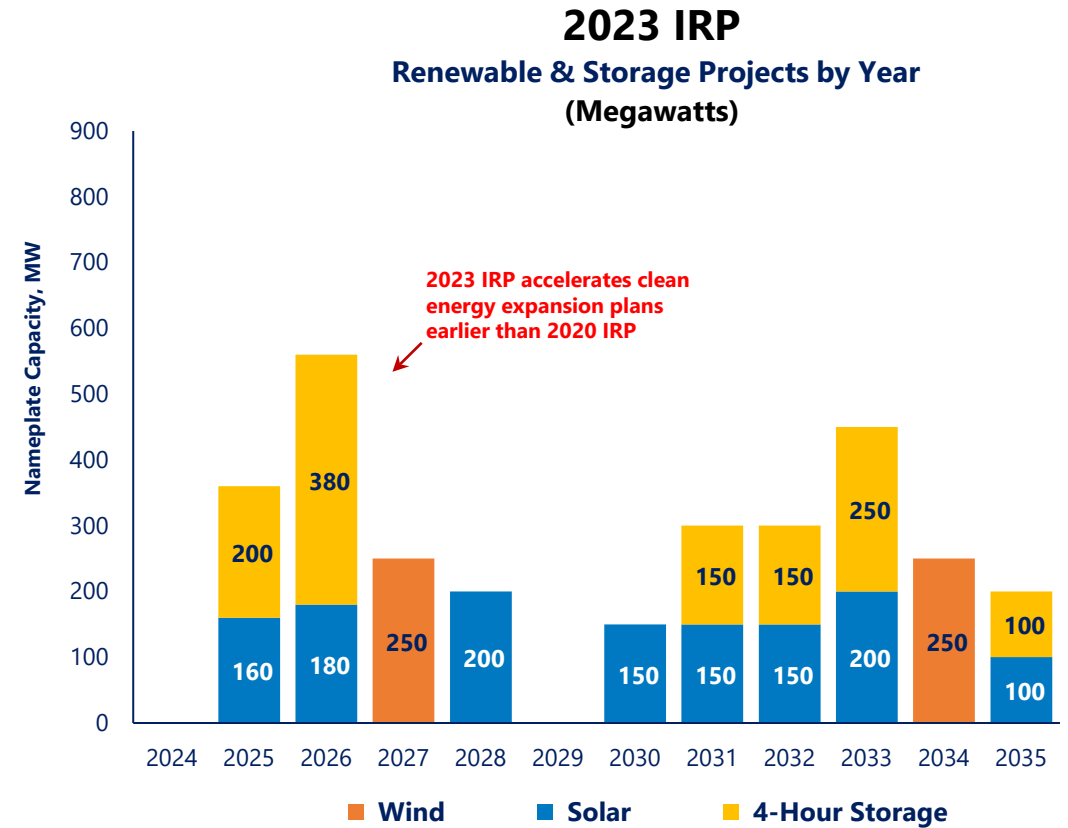
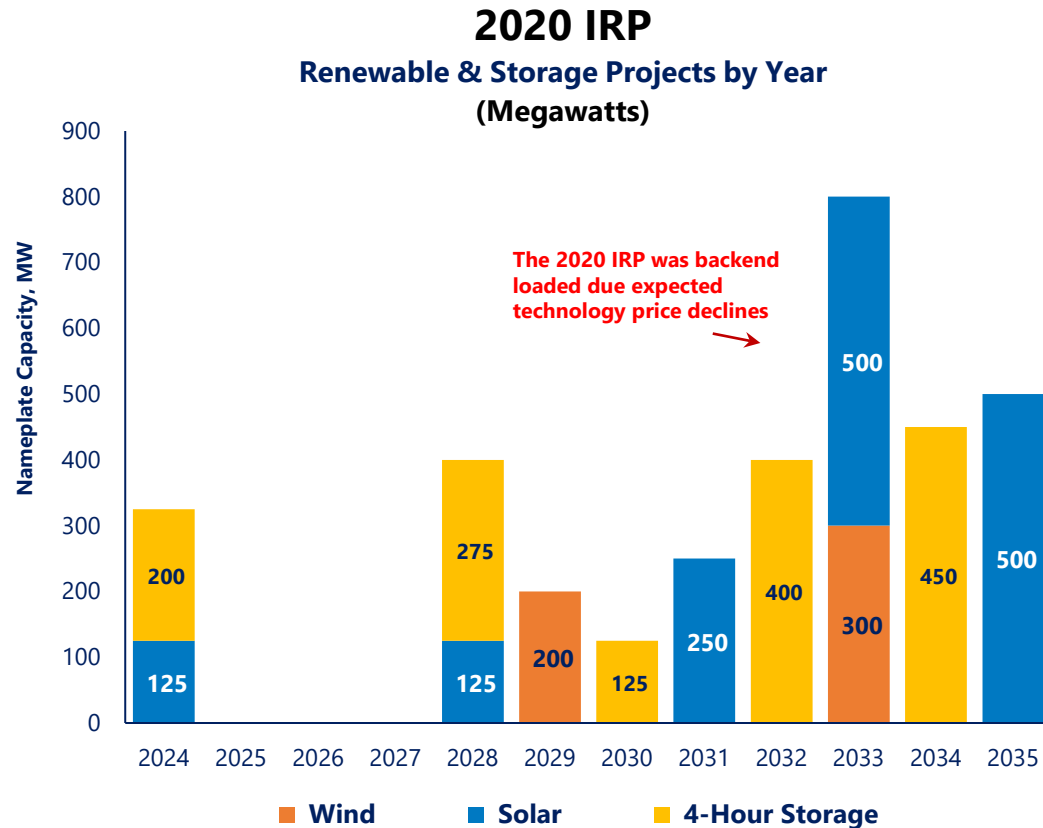
Notes:

- Future All-Source Requests for Proposals (ASRFP) along with successful project development will determine ultimate portfolio expansion plan.



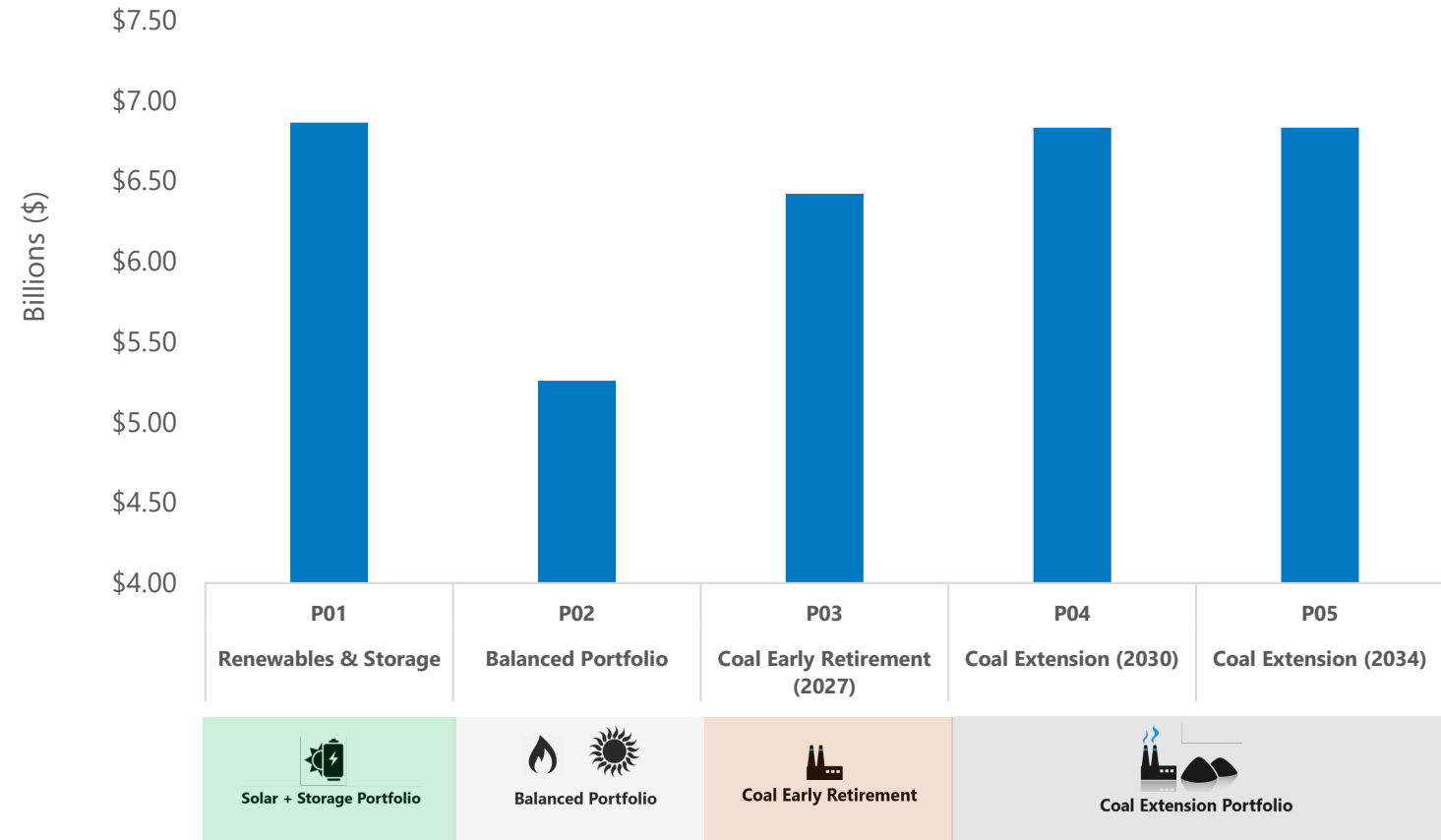
2020 IRP versus 2023 IRP Clean Energy Expansion

- The 2023 IRP Accelerates TEP's Renewable and Energy Storage Build Out



Portfolio Capital Expenditures (\$ Billion)

2024-2038 - Capital Expenditures by Portfolio (\$ Billion)



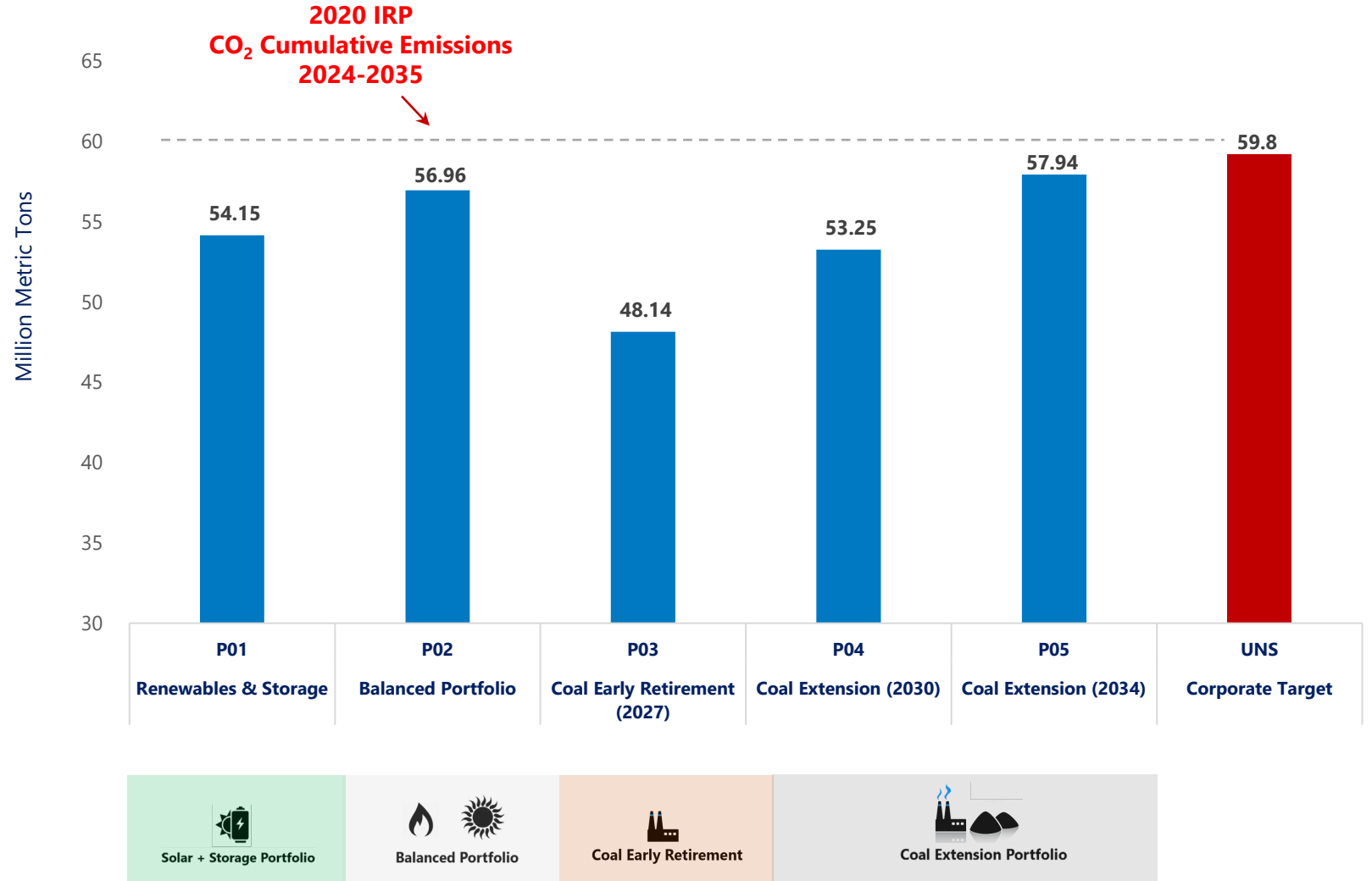
Portfolio Net Present Value Revenue Requirements (\$ Billion)

2024-2038 - Net Present Value Revenue Requirements (\$ Billion)



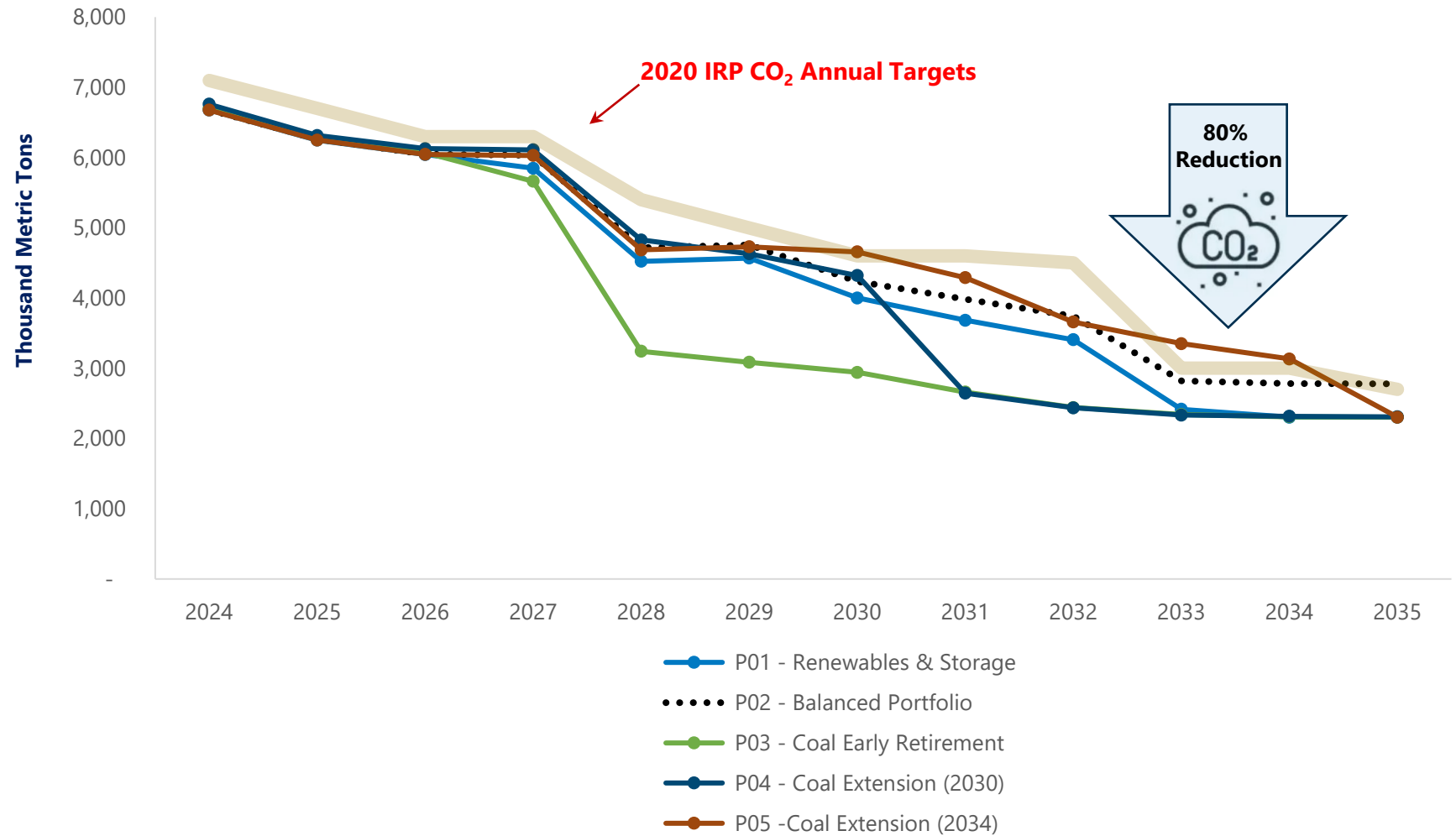
Cumulative CO₂ Emissions 2024-2035 (Million Metric Tons)

Cumulative Carbon Dioxide Emissions (CO₂) by Portfolio (Cumulative Million Metric Tons 2024 - 2035)



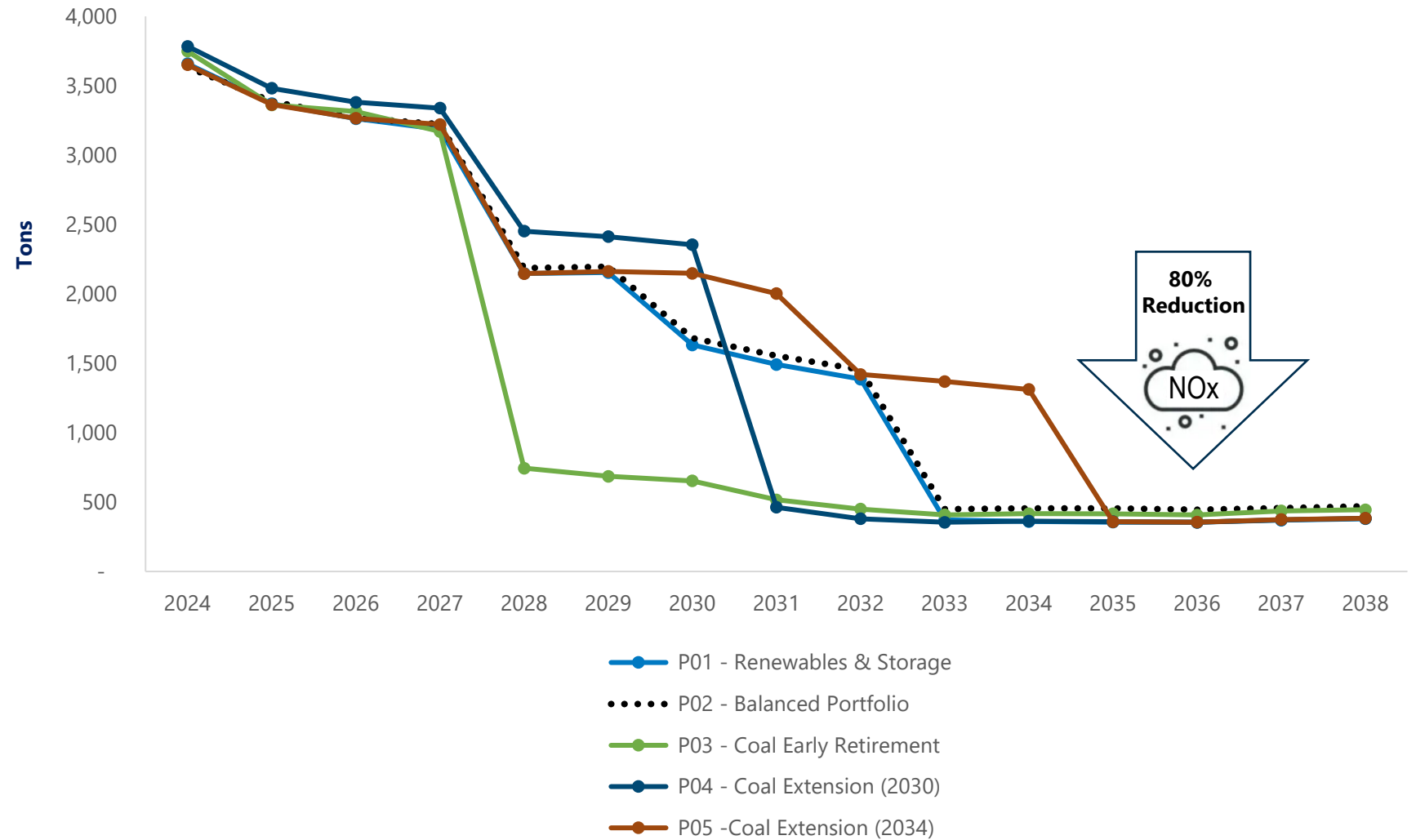
CO₂ Emissions by Portfolio (Thousand Metric Tons)

Carbon Dioxide (CO₂) Emissions by Portfolio (Thousand Metric Tons)



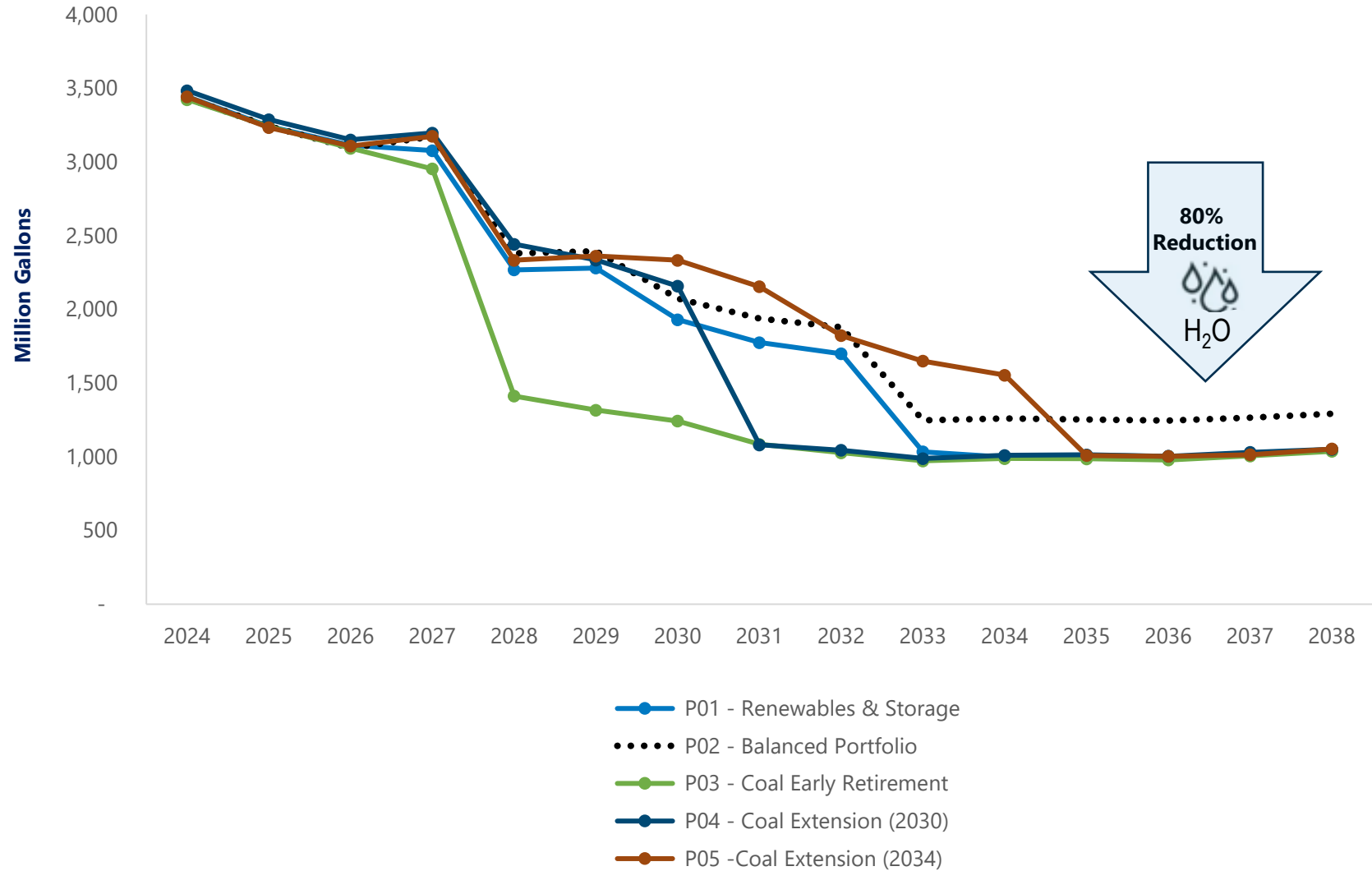
NO_x Emissions by Portfolio (Tons)

Nitrogen Oxide (NO_x) Emissions by Portfolio (Tons)



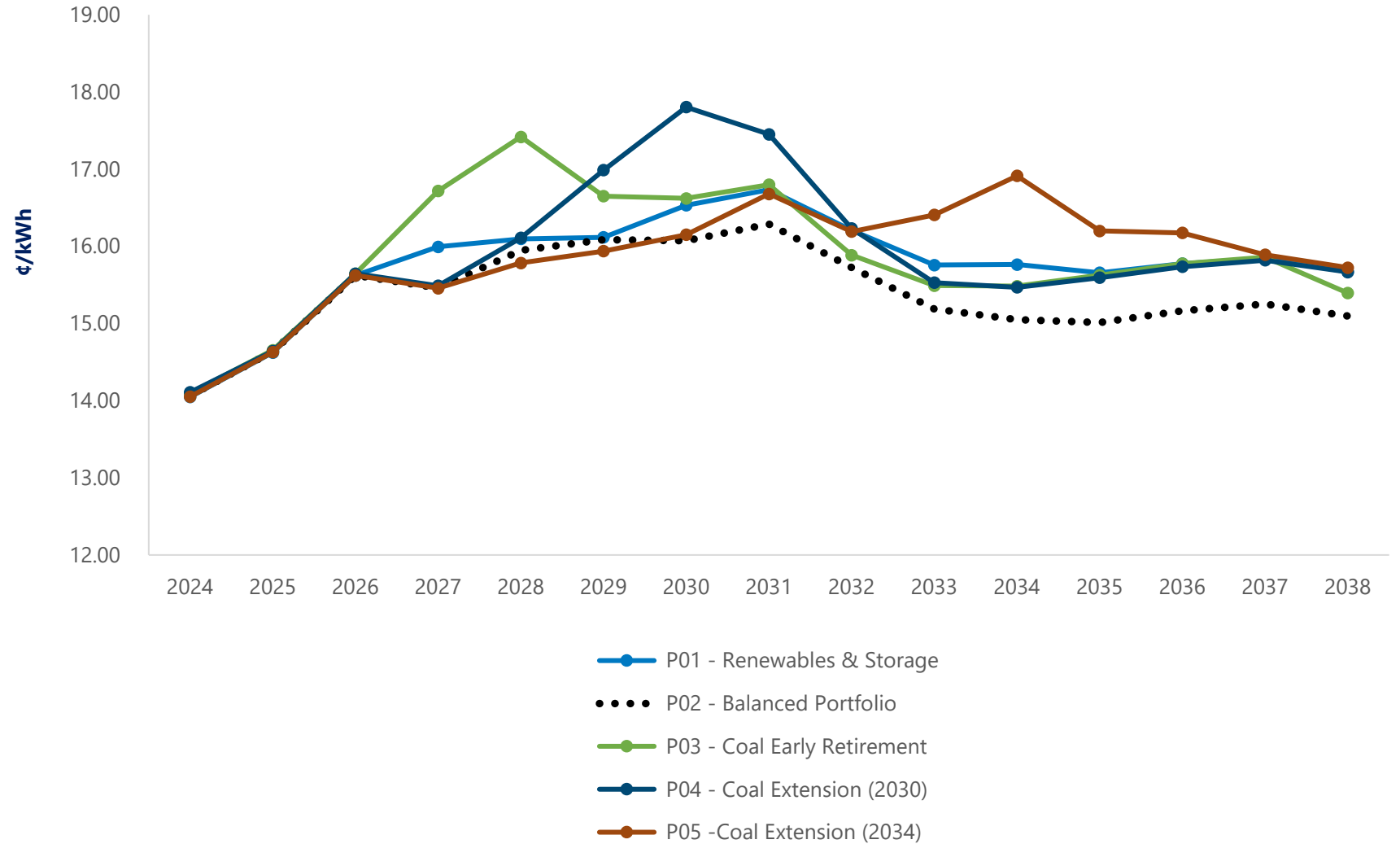
Water Consumption by Portfolio (Million Gallons)

Water Consumption by Portfolio (Million Gallons)



Estimated Customer Rate Impacts by Portfolio (¢/kWh)

Estimated TEP Customer Rate Impacts by Portfolio (¢/kWh)





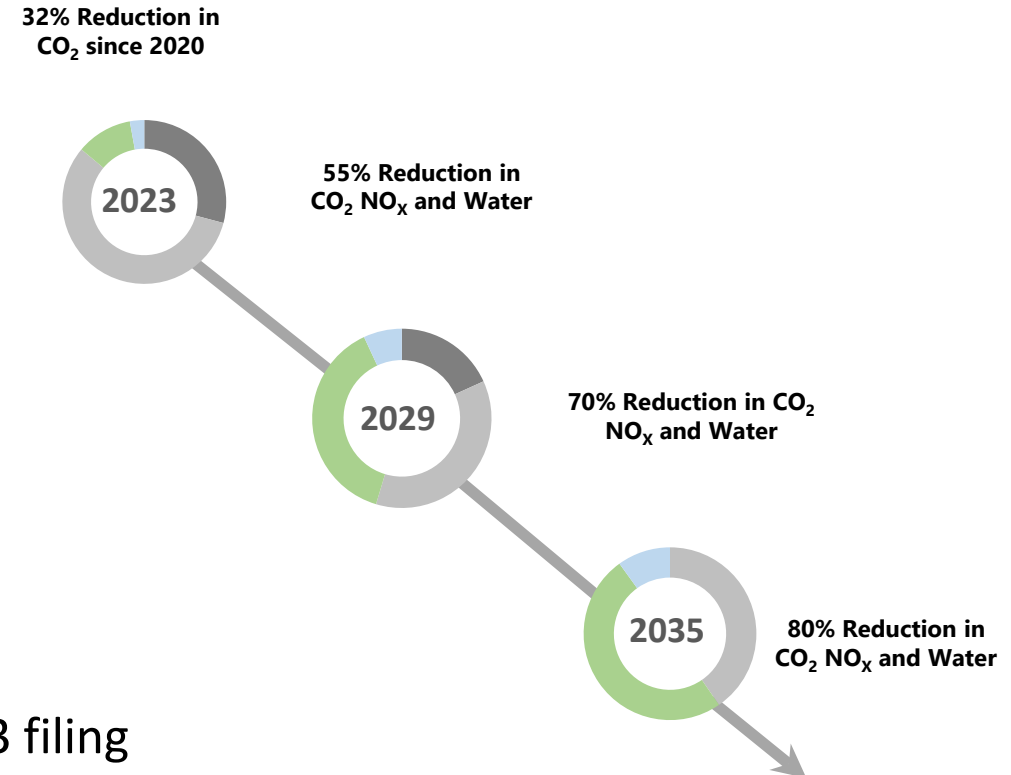
Implementation of TEP's Clean Energy Transition

Steady Progress Through 2035 Significant Environmental Benefits Relative to 2020

- Achieved through ASRFPs
 - Resource diversification
 - Long-term sustainability
 - Lower cost
- Maintains Reliability
 - Allow transition of coal retirements
 - Higher levels of renewables
 - Focus on capacity - storage and natural gas options
- Significant environmental improvements by 2035
- Preferred portfolios will be identified in our November 2023 filing

Note:

Any new resources will be developed through all-source RFPs, so a final energy mix will be determined by the resources proven to satisfy anticipated needs at the lowest cost while keeping us on track for our sustainability objectives.

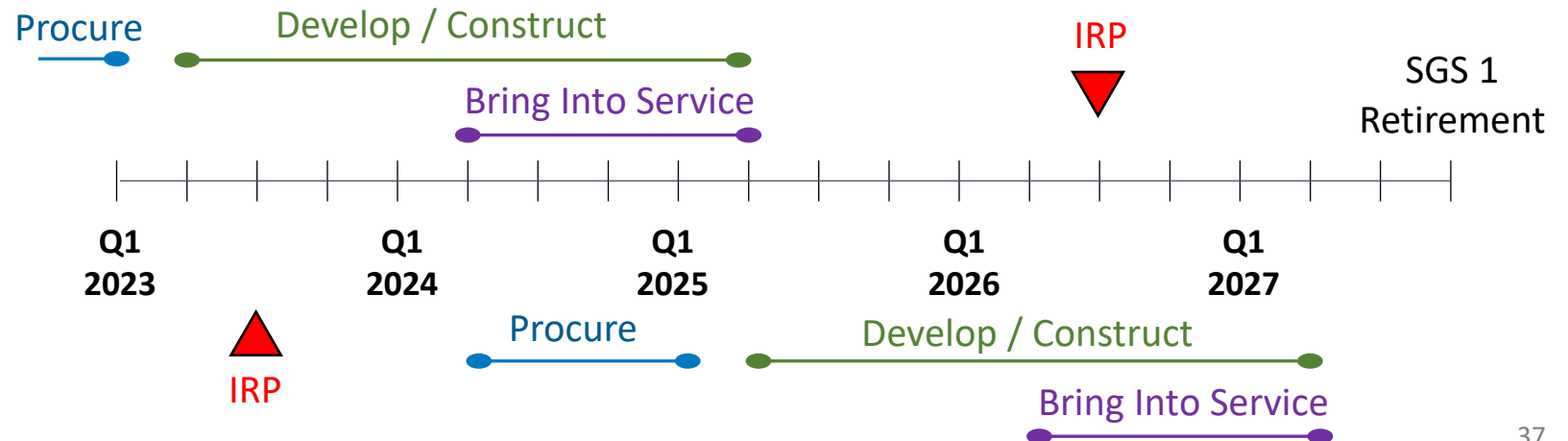
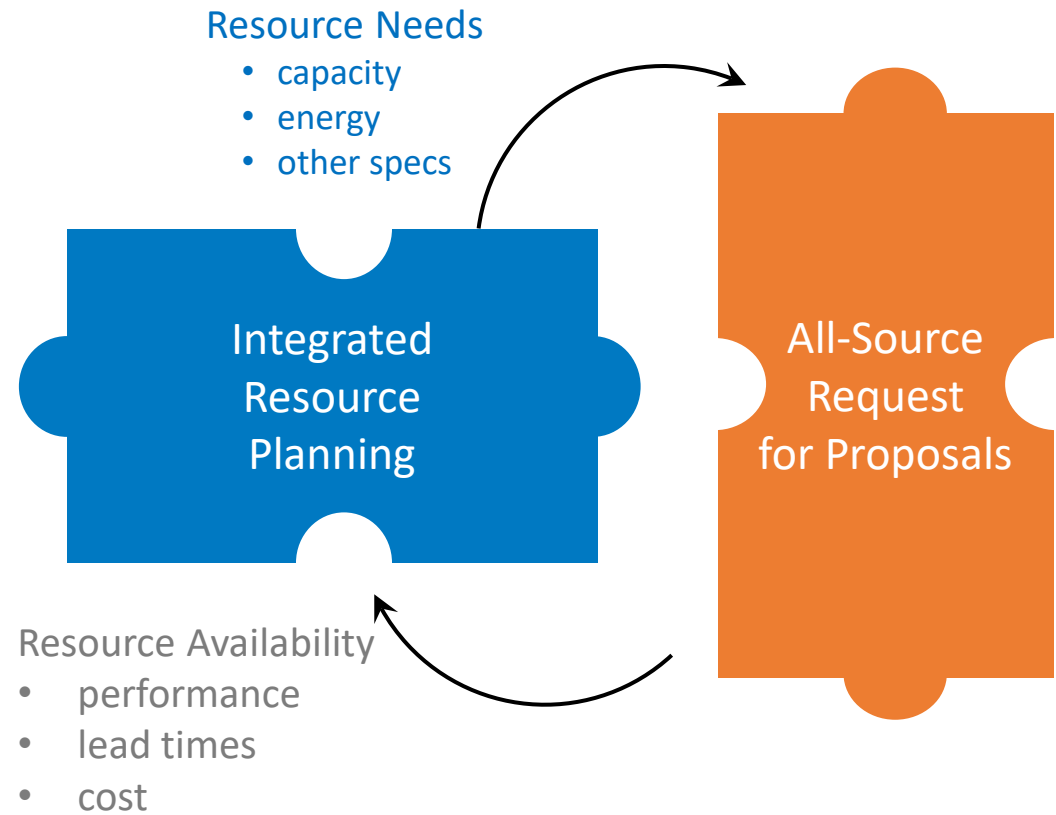




Integrated Resource Planning and Procurement

Going forward:

- Planning and procurement will be more tightly integrated
- Procurement will be more informed by long-term needs
- Long-term planning will be more informed by firm proposals
- Actual resource selection and implementation will depend more on market conditions at time of procurement





Next Steps

2023 IRP Filing Date

- **October 2023** – Resource Planning team to finalize results and written report
- **November 1, 2023** – File 2023 Integrated Resource Plan with the Arizona Corporation Commission (ACC)

Timeline After the IRP Filing

- **January 31, 2024** – Stakeholder comments due to ACC
- **May 31, 2024** – Company deadline to response to stakeholder comments
- **August 30, 2024** – ACC Staff issues IRP assessment and proposed order
- **Fall 2024** – ACC Open Meeting acknowledgement decision on 2023 IRPs



Public Feedback



TEP Portfolios Under Development

Portfolio	Name	Description / Design Objectives	Sensitivity Tests
TEP P01	Reference Case	<ul style="list-style-type: none"> Re-evaluates TEP's long-term plan acknowledged by the ACC in 2022 given new outlooks in future loads and resource costs and updated modeling capabilities. Provides basis for comparison to and amongst other portfolios. Load growth sensitivity tests to re-evaluate new resource needs and costs in the event demand does not grow or grows beyond current expectations. 	High/Low Market Prices High/Low Capital Costs High/No Load Growth
TEP P02	400 New Gas	<ul style="list-style-type: none"> Adds 400 MW of eight new, fast-start, fast-ramping aeroderivative combustion turbines in lieu of an equivalently-reliable amount of future solar and storage. Load growth sensitivity tests to re-evaluate new resource needs and costs in the event demand does not grow or grows beyond current expectations. 	High/Low Market Prices High/Low Capital Costs High/No Load Growth
TEP P03	SGS 2 Retire 2027	<ul style="list-style-type: none"> Retires Springerville Unit 2 five years early (2027), the same year as SGS 1. Includes costs for coal contract liquidated damages, coal contract early termination costs, and cost recovery through treatment of SGS 2 as a lower-return regulatory asset. 	High/Low Market Prices High/Low Capital Costs
TEP P04	SGS 1+2 Retire 2030	<ul style="list-style-type: none"> Retires both Springerville units in 2030 instead of 2027 and 2032. Assumes same amount of must-take coal volume as reference case but includes coal contract early termination costs. 	High/Low Market Prices High/Low Capital Costs
TEP P05	SGS 1+2 Retire 2034	<ul style="list-style-type: none"> Retires both Springerville units in 2034 instead of 2027 and 2032. Extends annual must-take coal volumes in reference case through 2034. Includes low-sulfur coal handling upgrades for Powder River Basin coal. 	High/Low Market Prices High/Low Capital Costs
TEP P06	Heavy Solar	<ul style="list-style-type: none"> Decreases future wind from 500 MW to 250 MW and adds solar (and storage if necessary) to reliably achieve the same amount of CO₂ reduction. Evaluates cost differences and system integration capabilities in the event market conditions, load patterns, or system operations favor relatively more solar deployment. Evaluates appropriateness of wind/solar capacity mix assumed in other portfolios. Assumes low capital cost assumptions only for solar. 	



TEP Portfolios Under Development

Portfolio	Name	Description / Design Objectives	Sensitivity Tests
TEP P06	Heavy Solar	<ul style="list-style-type: none"> Decreases future wind from 500 MW to 250 MW and adds solar (and storage if necessary) to reliably achieve the same amount of CO₂ reduction. Evaluates cost differences and system integration capabilities in the event market conditions, load patterns, and/or system operations favor relatively more solar deployment. Evaluates appropriateness of wind/solar capacity mix assumed in other portfolios. Assumes low capital cost only for solar. 	
TEP P07	Heavy Wind	<ul style="list-style-type: none"> Increase future wind from 500 MW to 750 MW and decrease solar (and storage if possible) to reliably achieve the same amount of CO₂ reduction. Evaluates cost differences and system integration capabilities in the event that market conditions, load patterns, and/or system operations favor relatively more wind deployment. Evaluates appropriateness of wind/solar capacity mix assumed in other portfolios. Assumes low capital cost assumptions only for wind, but also a \$48/kW-year transmission wheeling cost for the additional 250 MW given the lack of available transmission capacity on the east side of TEP's transmission system, which is located closest to high-value wind resources in east NM. 	
TEP P08	Mid-Duration Storage / Pumped Hydro	<ul style="list-style-type: none"> Replaces all Li-ion battery storage brought into service from 2033-2038 with an equivalently-reliable amount of 10-hour storage brought into service in 2033 with ATB assumptions for cost and round-trip efficiency (80%) and a capacity credit of 75% based on interpretation of TEP's ELCC study. Assumes reservoir would be located in northern AZ and that only 300 MW could be transmitted before having to purchase additional transmission capacity at \$48/kW-year. Relocates 1,000 MW of storage to remote location to support remote storage. 	High/Low Market Prices
TEP P09	Clean Firm Power / Small Modular Nuclear Reactors	<ul style="list-style-type: none"> Replaces all Li-ion battery storage brought into service from 2033-2038 with an equivalently-reliable amount of nuclear power brought into service in 2033. 	High/Low Market Prices
TEP P10	Market and Transmission Reform	<ul style="list-style-type: none"> Increases market depth by assuming 50% more import/export capability and 25% lower market prices. 	High/Low Market Prices