Responses to Questions/Comments from 10/20/2022 Rate Advisory Committee Meeting and Subsequent Interactions

Q&A Packet #2 - Numbering Starts at Question 23 - Version: 11/17/2022

23. Slide 24 – Build vs Buy Sensitivity: Explain the purpose of this analysis.

    - The Build vs Buy sensitivity analysis is designed to assess the Affordability and Workforce metric tradeoffs for CPS Energy when comparing future capacity additions from resources located in the San Antonio area that CPS Energy builds, owns and operates (i.e. "Build"); versus capacity additions that come from resources that are not located in the San Antonio area, acquired via contract (i.e. "Buy").
    - The "Build" result uses the Reference Scenario assumption that CPS Energy would own new gas, hydrogen, and geothermal capacity additions. Any wind, solar, and storage capacity would be procured through power purchase agreements ("PPA").
    - The "Buy" sensitivity tests the impact of an alternative capacity procurement strategy, whereby CPS Energy would procure all new capacity through contracts including gas, hydrogen, and geothermal. Any wind, solar, and storage capacity would continue to be procured through power purchase agreements ("PPA").
    - This sensitivity is only applied to Portfolio 4. However, the directional impact is likely to be the same across all portfolios, scaled up or down depending on the magnitude of capital expenditures shifted towards PPAs.

24. Regarding the ERCOT Scenario Input Variables, was it assumed that the ERCOT grid would remain isolated from adjacent grids or be connected to adjacent grids?

    - It was assumed that the ERCOT grid would remain isolated from adjacent grids. There have been proposals to connect the ERCOT grid to adjacent grids, but none of the proposals are moving forward at this time.

25. Slide 19 – 2030 Generation Mix (TWh) by Portfolio: Why is storage and hydrogen shown as negative generation, i.e. below the zero line?

    - Battery storage resources are less than 100% efficient, so from a net perspective they contribute negative generation to the portfolio whenever they complete a charge and discharge cycle. Hydrogen resources are also shown as negative generation, since the analysis accounts for the electricity that is used to electrolyze water into hydrogen, which nets off the electricity that is produced for the system when the hydrogen is consumed. Therefore, when reporting generation mix (TWh) results, batteries and hydrogen are treated as storage resources that shift energy to different hours rather than other power technologies that can produce electric energy (such as nuclear, coal, gas, and renewables). The slightly negative energy numbers in the generation mix account for the energy lost during the storage process.

26. Slide 27 – Scorecard: The Renewable Portfolios are lower in CO2 emission intensity than the Gas and Blend Portfolios. Would the Renewable Portfolios also be the most unreliable/non-dispatchable?

    - Portfolios like P6 & P7, that rely on renewables and storage and rapidly retire dispatchable fossil generation, approach zero CO2 emissions intensity in the later years. These portfolios also performed comparatively lower on the System Reliability (Capacity Headroom/Expected Reserve Margin) and System Flexibility (Market Purchases and Dispatchability) metrics. This tradeoff is shown in the draft scorecard slides 30 and 31 that were presented in the October RAC meeting.

27. Hydrogen requires fossil fuels and a lot of water. How is this defined as renewable? Are there plans in place for water scarcity? If referring to hydrogen production, you need water to produce green hydrogen.

    - Hydrogen can be produced in different ways. Some hydrogen production methods use fossil fuels, including natural gas, while other methods use energy from renewables to produce hydrogen. We are assuming that renewable energy powers an electrolysis process, resulting in "green" hydrogen production. The hydrogen is assumed to be green in order to qualify for the $3/kg green hydrogen production tax credit (PTC) in the Inflation Reduction Act (IRA). We also assume that small amounts of hydrogen resources (240 MW in 2030) begin to be added to Portfolios P3 through P9, starting in 2030 (see slide 16 from the October RAC meeting).
    - The hydrogen industry is still nascent, and CPS Energy only allowed this option to be available in 2030 and beyond. Thus, CPS Energy plans to continue to track the market opportunities over the next several years to validate whether green hydrogen can be procured at sufficient scale and consistent with the costs assumed in this generation planning analysis, else pivot to another technology in the generation plan. Water use is an important factor that will be considered as hydrogen technology develops.

28. Can grey water be used in place of clean water for hydrogen production?

    - Yes, there could be some opportunity to use grey water for hydrogen production.

29. Geothermal: Do we know the site of future geothermal, and please comment if the technology has waste & earthquake issues.

    - The geothermal system we are looking into could potentially be located in South Texas. It is a closed-loop geothermal system (i.e. the fluid that moves the geothermal heat is recirculated) and is generally safer than other geothermal technologies that use ground water extraction and re-injection. The potential for inducing earthquakes will be studied, and consultants will be hired to look into this issue and to identify specific sites for geothermal plants.
    - The geothermal industry is beginning to introduce new technologies that may be suitable for the geology in Texas. CPS Energy only allowed this option to be available in 2030 and beyond, and assume that small amounts of hydrogen resources (25 to 275 MW) begin to be added to Portfolios P3 and P5 through P7, starting in 2030 (see slide 16 from the October RAC meeting). The uncertainty with geothermal technology is reflected in the high upfront initial cost. Once upfront capital is spent, there is no recurring fuel cost, although we do assume recurring operations & maintenance costs.
    - CPS Energy plans to continue to track the market opportunities over the next several years to validate whether geothermal can be procured at sufficient scale and consistent with the costs assumed in this generation planning analysis, else pivot to another technology in the generation plan.

30. What is CRA/CPS Energy definition for Climate Resiliency?

    - The Climate Resiliency objective was previously paired with the Environmental Sustainability objective. Based on the feedback from the RAC at the September 20th meeting, we moved Climate Resiliency to be paired with the System Reliability objective. This objective is now named System Reliability & Climate Resiliency.
    - The two metrics associated with Climate Resiliency relate to the performance of the portfolio under extreme weather conditions. The two metrics are: (1) 2030 Revenue Requirements during Extreme Weather Exposure and (2) 2030 Market Purchases during Extreme Weather Exposure.

31. How much debt can CPS Energy flow through bond and still maintain its current credit rating?

    - CPS Energy funds its capital plan by two sources: Our own equity, which is our repair & replacement account or by funding this capital through debt proceeds. Currently CPS Energy has approximately $6B of long-term debt and we maintain a debt / capitalization ratio in the low 60%. This is typical of an AA rated[1] utility such as ours. Additionally, we have a robust coverage ratio for our rating (over 1.8x) which demonstrates how many times over we can service our annual debt service. This ratio is also a financial metric the rating agencies look at to ensure we have enough cash flow to service our debt obligations.

32. Is there a safe ratio of dispatchable and non-dispatchable generation?

    - The amounts of dispatchable and non-dispatchable generation in the generation mix is a hot topic in the industry. Ultimately, system planners and market operators establish reserve margins and resource capacity accreditation contributions to the reserve margins. For this analysis, CPS Energy optimized under a number of constraints, not just to solve for the ratio of dispatchable and non-dispatchable generation. The CPS Energy portfolio capacity addition analysis was optimized around the following variables:
        - Reserve margin: peak load plus 13.75% minimum
        - Available technologies: plant size, when available, & how much is available - see slide 66 from the October RAC meeting
        - Capacity accreditation for existing and new technologies: including assumed declines for certain non-dispatchable and storage resource types over time to reflect their relative decline in capacity value to the system – see slide 67 from the October RAC meeting for a summary of resource accreditation assumptions
        - Energy balance: native load with 20% to 25% wholesale energy limit
        - Minimize present value of system costs
    - The generation mix for each portfolio is a result from the capacity addition optimization analysis, and the mix of dispatchable and non-dispatchable generation for each portfolio can be measured from the optimization results. The resulting metric scorecard for each portfolio will show tradeoffs among the objectives, including cost and potential market exposure. As the wider ERCOT market adds more non-dispatchable generation, CPS Energy will continue to assess the risk profile of its portfolio associated with meeting peak demand as well as demand for all hours throughout the year.

33. Slide 26 – Capacity Headroom: The chart shows short term elevated reserve margin of Portfolio P2 dependence upon the decommissioning of resources. Portfolio P2 shows a short term rise before subsequent decommissioning of resources. To what degree does CPS Energy contact or coordinate with other public utilities in Texas to take advantage of any short-term fluctuation in reserve margin?

    - Our primary objective is to serve our native (retail) load, and when there is opportunity in the wholesale market to make sales, we take advantage of that to make margin, and the benefits flow directly to our customers. In last 3 years, our wholesale sales averaged about 20% of our total output (in MWh). We continue to optimize our portfolio day-to-day, hour-to-hour for the benefit of our customers.

[1] The "AA" rating is a letter grade given by private independent rating agencies that indicates the creditworthiness of CPS Energy's bonds.

- We also purchase from the wholesale market at times when the cost is lower than our generation, which also benefits our customers. Historically, CPS Energy's annual amount of wholesale purchases tends to be relatively low, since we tend to be a competitive generator relative to the market.

34. Slide 16 - Cumulative Capacity Additions Between 2023 and 2030 (MW): What does "N/A" mean? "Not Applicable" or "Not Available"?

    - "N/A" means "Not Available" for selection in the capacity addition optimization analysis.
    - For the nuclear technology row, there are cells with "–", which means it was available for selection in the capacity optimization, but was not selected.
    - Note that Long-Duration Storage, Geothermal, Hydrogen, and Nuclear are only available for selection starting in 2030 and beyond. If those technologies do not develop and become widely commercially available, we will pivot to other technologies.

35. How does the Inflation Reduction Act (IRA) legislation factor in to the planning?

    - The IRA is incorporated in all portfolio modeling, including hydrogen production tax credits. For Green hydrogen production, the IRA offers a $3 per kilogram incentive, which is roughly equivalent to $20/mmBtu, which should help higher-cost hydrogen be more competitive with the cost of natural gas. As a comparison point the cost of natural gas is in the $4-6/mmBtu range now.

36. Why can't we also include criteria like SOx and NOx emissions like CO2? Especially if CPS Energy still has gas in the mix?

    - The core scorecard metric will be focused on CO2 emissions which aligns with the City of San Antonio's Climate Action and Adaptation Plan. Projections for 2030 carbon dioxide, nitrogen oxides, and sulfur dioxide emissions intensity by scenario and portfolio are contained in the appendix to this document.

37. Slide 30 - Portfolio Metric Results – Reference Scenario ONLY: Portfolios P6 & P7 reserve margin is at 13.2% & 13.1%, respectively, as compared to the standard of 13.75%. What is that impact? It seems minor but the dark shading indicates "unfavorable"?

    - The shading indicates the relative range of outcomes across portfolios. The P6 & P7 reserve margin metric results indicate that by 2030, with retirement of dispatchable resources, there is an expectation that the reserve margin could potentially be lower for portfolios with high renewables and storage in the generation mix, given the uncertainty in capacity accreditation at peak for renewables and short duration storage technologies. Also see response to Question 42b in this packet for additional detail on this topic.

38. Please discuss how the future peak demand was determined. I'm especially concerned about underestimating future population growth, and under estimating the energy usage of future electric vehicles charging needs. Electric vehicles (EV) would ideally be charged in the middle of the night. However, CPS Energy currently has no means of charging residential customers higher demand charges on an hourly basis. Without a way of charging/penalizing individuals for charging EVs during peak evening hours, there is no real means of stopping customers for charging these vehicles when they arrive home in the evening.

    - CPS Energy's load forecast contains projections for population growth, economic growth, EV adoption, and customer solar PV adoption. Hourly EV charging profiles are a feature in the forecast.

- EV penetration is included with reasonable assumptions, and we are monitoring this issue closely due to the uncertainty and risk. We have an EV pilot program designed to verify customer EV charging patterns and customers will be incentivized to charge during non-peak hours. This is still in early stages, but we are aware of it. We will adjust our load forecast as new information on population growth and EV adoption becomes available.
- In the Net Zero Economy Scenario, we assume a high level of electrification load, which includes higher EV adoption than the Reference Case – Baseline EV adoption rate.

39. When speaking of phasing out gas, has consideration been given to the impact and cost for customers that have gas furnaces and stoves? Won't the phase out of gas impact the cost of gas to the customer and increase it?

- When we mention phasing out gas, the core analysis here is about natural gas electric generation, not phasing out the gas system at large. The generation portfolio options we are evaluating have lower gas consumption for electricity generation.
- In the Net Zero Carbon Economy Scenario, customer demand is assumed to be higher than the Reference Scenario due to increased "electrification", where EVs are assumed to increase in adoption rate and more customers move from gas to electricity. However, increased electrification is not mandated, nor does CPS Energy assume that increased electrification will impact gas procurement and delivery for gas customers.

40. Have these results been shared with the RAC consultant?

- Yes.

41. Is the hydrogen assumed to be green, blue or gray? Only green (produced using only renewable energy) counts as renewable. What is the plan to track and verify?[2]

- The hydrogen is assumed to be green in order to qualify for the $3/kg green hydrogen production tax credit (PTC) in the Inflation Reduction Act (IRA). This is the consistent with the discussion held with RAC member Belmares on August 25, when we reached agreement that hydrogen technology could be considered in "renewable only" portfolios if it was assumed to be green.
- For modeling purposes, the hydrogen unit is effectively treated as a long-duration storage facility, using green electricity to electrolyze water during certain hours and then burning the hydrogen during other hours. The hydrogen industry is still nascent, and CPS Energy only allowed this option to be available in 2030 and beyond. Thus, CPS Energy plans to continue to track the market opportunities over the next several years to validate whether green hydrogen can be procured at sufficient scale and consistent with the costs assumed in this generation planning analysis, else pivot to another technology in the generation plan. Green hydrogen could be produced in an electrolyzer using electricity from devoted renewable resources like wind and solar or through verified purchases at points on the electric grid where clean energy is marginal. CPS Energy will monitor market developments, particularly the reporting and verification rules as they develop for IRA PTC qualification.

42. My scenarios aren't being treated fairly in this analysis in at least a couple of ways.

a. Market purchases are assumed to be higher, but this doesn't need to be so. Please run P5, P6 and P7 without assuming market purchases. It's fine to run them both ways, but the scenarios proposed assumed CPS would plan ahead to procure sufficient renewable energy and storage to replace the coal plant retirements.

[2] Questions 41 through 45 were submitted by RAC member DeeDee Belmares after the October 20th RAC meeting.

- Market purchases are an outcome of the portfolio analysis and were not assumed to be higher or lower for any portfolios. All portfolios (P1 through P9) were developed under the same constraints. As shown on slide 19 of the October 20 RAC presentation, all 9 portfolios generate similar amounts of total energy across the year. However, portfolios that remove large amounts of dispatchable capacity resources (particularly P6 and P7) and replace the energy with primarily intermittent resources will be "long" in output in certain hours or "short" in output in other hours resulting in being reliant on the market to sell excess energy when long and to buy needed energy when short. To minimize the hours of a long or a short position, the portfolios have a significant amount of storage capacity additions by 2030 (3,160 MW and 4,210 MW of storage in P6 and P7, respectively). Given current storage duration technology maturity, a significant amount of additional storage would be needed to completely eliminate all market purchases, raising the costs of these portfolios materially. CPS Energy appreciates this comment and encourages RAC discussion on the topic, but we believe the current portfolios represent a reasonable outcome for the stated theme, given current technology and market constraints. As shown in slide 34 of the October 20 RAC presentation, all portfolios have some level of energy market purchases.

b. Reserve margins are assumed to be lower for P6 and P7, but that doesn't have to be so. Please bring the reserve margin brought up in line with the other scenarios for P6 and P7 by adding more of whichever renewable energy or energy storage resources would most affordably and effectively achieve that goal.

- Reserve margins are an outcome of the portfolio analysis and were not assumed to be higher or lower for any portfolios. As noted in the October 20 RAC meeting, CPS Energy does not consider a 1-2% difference in reserve margin as a reason to disqualify a portfolio. P6 and P7 remove the largest amount of firm, dispatchable capacity from the existing portfolio, replacing it largely with intermittent resources and storage. There is more reserve margin risk associated with these portfolios, since the amount of wind, solar, and short-duration storage capacity available during peak hour is less predictable.

43. Is there a threshold for the amount (in MW and MWh) of dispatchable generation that CPS Energy believes is needed to reliably meet demand? Is that implied in the reserve margin number or does it need to be defined separately?

- CPS Energy is using the current generation planning exercise to illustrate the tradeoffs between reserve margin, energy sales and purchases, dispatchable capacity, and performance during extreme weather events. Ultimately, reserve margin is the primary metric for reliability, and our analysis incorporates expectations for the reserve margin contributions for all portfolios over time (See slide 67 in the October 20th RAC meeting presentation).

44. What types of battery storage technology are assumed?

- Short-duration storage technology (8 hours and less) was assumed to be lithium-ion-based batteries (see slides 73 and 74 from the October RAC meeting presentation for cost outlooks for the 4-hour and 8-hour battery technologies). For longer-duration storage technology, 20-hour flow batteries, 20-hour compressed air, and 20-hour pumped thermal technologies were evaluated (see slides 75 and 76 from the October RAC meeting presentation for cost outlooks). The preferred 20-hour long-duration storage technology based on current market expectations for this analysis is a flow battery.

45. How can scenarios that rely on market purchases also show a positive reserve margin? Are those market purchases assumed to be contracts? If so, please provide more information about what is assumed.

- *Reserve margin* is a "capacity at peak" concept, while *market purchases* can be considered for both "capacity" (short-duration bilateral contracts to meet peak reserve margin targets) or

"energy" (purchased from the market throughout the year). Reserve margin is a planning concept based on predicted available capacity at peak. When developing reserve margin projections, one must estimate availability of capacity resources just for CPS Energy's peak load hour. When early retirements are made in portfolios and new capacity is not yet available, the modeling has assumed short-term bilateral capacity purchases to cover the reserve margin capacity position (for example, see slide 52 from the October 20th RAC meeting showing annual capacity purchases for P5). By 2030, all portfolios were assumed to have sufficient new resources that no longer require purchases for peak capacity accounting (reserve margin). A portfolio may purchase energy from the market at various times throughout the year when intermittent capacity is unavailable, or if it is more economical, to buy from the ERCOT market. The scorecard metric for 2030 is only recording these energy purchases from the market at various hours throughout the year. It is possible to have a positive reserve margin at the net peak hour for planning purposes, and to still purchase substantial amounts of energy from the ERCOT market throughout the year.

46. Because the recently-passed Inflation Reduction Act (IRA) legislation will provide incentives to projects that will contribute to carbon emission reductions, a carbon price should not be included in the Reference Scenario.[3]

- Half of the portfolio runs (nine in the Carbon-Based Economy Scenario and nine in the Volatile Market Scenario) assume no carbon price, so those results will be informative. The Reference Scenario includes a carbon price as does our budget. Implementing a carbon price is a common resource planning technique used across the industry to acknowledge on-going regulatory pressure on carbon emissions. Our generation plan and budgets have included a carbon price for many years. Keeping the carbon price in the Reference Scenario is consistent with the internal budget that we are using now.
- Including a "baseline" carbon price in the Reference Scenario was first proposed in July and every month thereafter. The Inflation Reduction Act legislation was signed into law in mid-August, after we set the assumptions and began modeling. The Reference Scenario carbon prices are smaller in 2027 through 2030. It is also plausible that a carbon price could be enacted in future legislation if the carbon reduction objectives outlined in the IRA are not achieved.
- It is too late to change the Reference Scenario to remove the carbon price assumption without a significant impact to schedule. End-to-end re-runs could affect all 50 results because we would have to assess how the Reference Scenario change meshes with the other three Scenario and Sensitivity run assumptions.

[3] Questions 46 and 47 were submitted by RAC Co-Chair Reed Williams after the October 20th RAC meeting.

47. Reference Scenario – Portfolios P1 & P4 don't adhere to interim CAAP targets so they aren't really viable. Is that right? Do adjustments need to be made?

    - The preliminary Environmental Sustainability objective of the scorecard indicates that Reference Scenario – Portfolios P1 and P4 do not meet the 2030 Climate Action and Adaptation Plan (CAAP) interim targets for CO2 intensity reduction (see table below).

October 20th Preliminary Results	2030 - Percent CO2 Intensity Reduction	2030 - CO2 Intensity (lb/MWh)
CAAP Interim Target (Relative to CY2016)	41% (minimum)	543 (maximum)
P1 (Gas) – Reference Scenario	37%	578
P4 (Blend, Retains Coal) – Reference Scenario	30%	641

    - CAAP interim target adherence is a consideration but not an automatic disqualifier. We need P4 (which retains coal) to address the direction that the Board provided to us in their resolution adopted in February of this year to consider the costs, timeline and generation alternatives necessary to transition from coal to lower emission cleaner alternatives by the 2030 timeframe. These preliminary portfolios could also potentially be modified to meet the interim CAAP goals at a later stage in the process.
    - We should not disqualify any portfolios at this preliminary stage. Our aim is to understand all metrics and the trade-offs across all portfolios.

48. Is it sufficient to only run the extreme weather sensitivity under Reference Case conditions? Should we also consider assessing extreme weather under the Volatile Market scenario, which might currently be more reflective of current reality?[4]

    - The extreme weather sensitivity is intended to be a stress test for all portfolio options under market conditions that deviate significantly from the norm, regardless of the underlying scenario fundamentals. For example, while the natural gas prices may vary by around $3/mmBtu between the Reference Case and Volatile Market scenarios in 2030, the extreme weather sensitivity will test short-term price spikes as high as $300/mmBtu. Similarly, power prices in the extreme weather sensitivity are modeled to hit the $5,000/MWh cap for many hours, an outcome that would be the same regardless of whether the underlying fuel price and ERCOT market fundamentals were consistent with the Reference Case or the Volatile Market scenario. Therefore, CPS Energy believes that evaluating the extreme weather sensitivity under one scenario will provide sufficient insight to assess the relative performance of the different portfolio options.

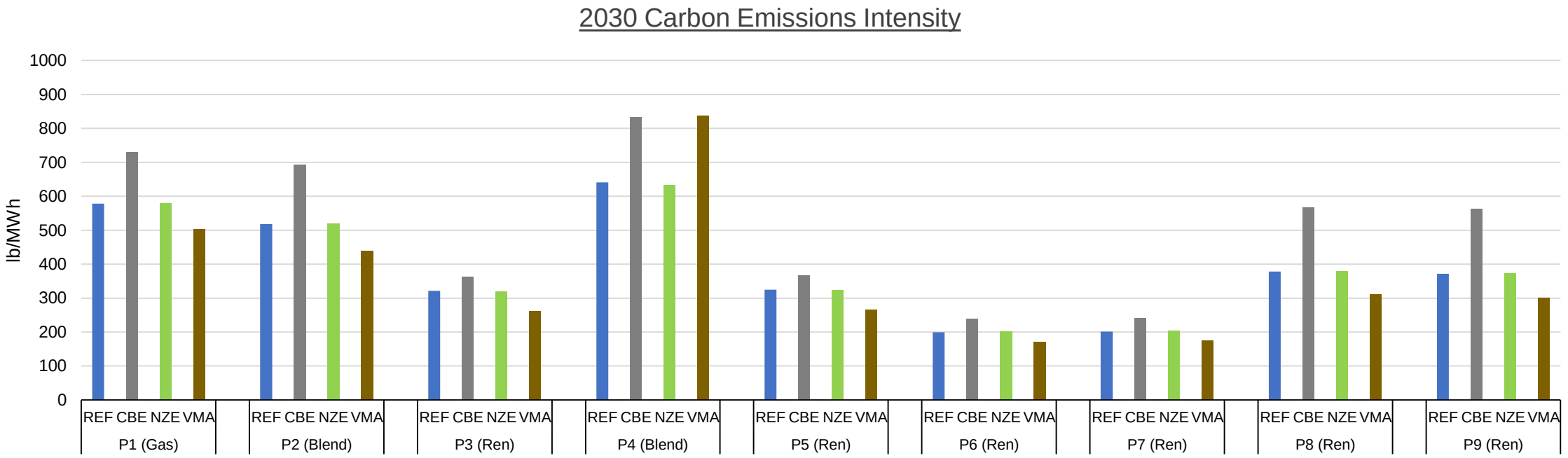
APPENDIX: PROJECTIONS FOR 2030 EMISSIONS INTENSITY

[4] Question 48 was address by CRA at the November 3rd Q&A session with Burns and McDonnell.

APPENDIX:

PROJECTIONS FOR 2030 EMISSIONS INTENSITY

2030 Carbon Emissions Intensity – By Scenario and Portfolio

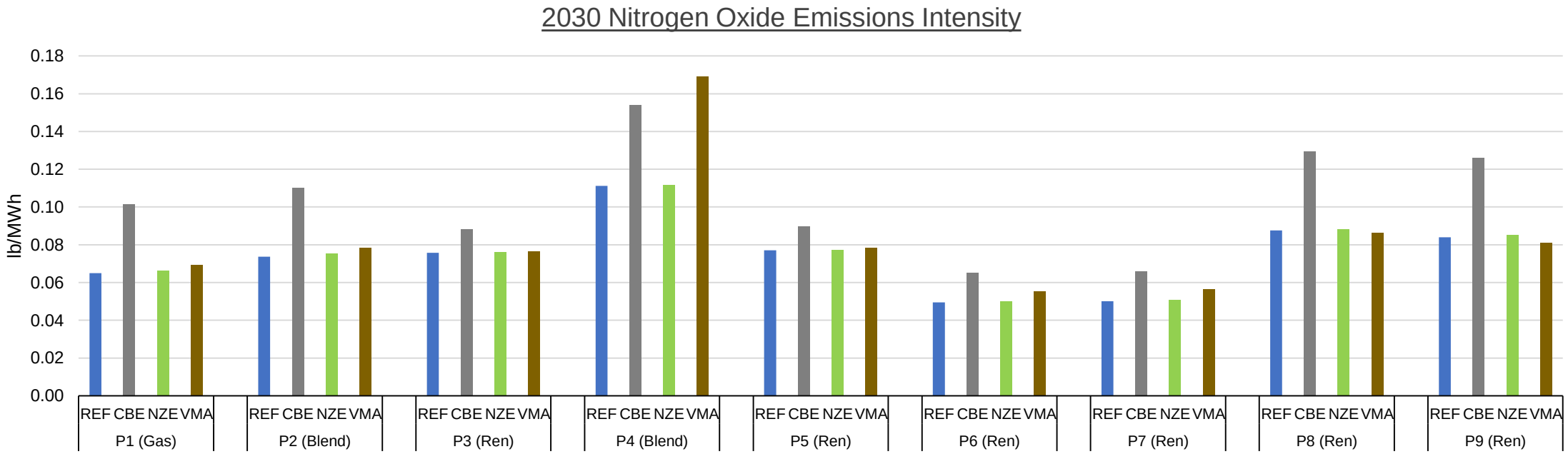


- The CBE scenario generally results in the highest emission intensity for all portfolios (except P4). This is because low natural gas prices and no carbon prices lead to higher gas plant capacity factors.
- The VMA scenario generally has the lowest emission intensity across all portfolios (except P4). This is because high natural gas prices lead to lower gas generation and more market purchases. In P4, emission intensity is high because of higher coal generation from the two Spruce units, as coal is more competitive relative to natural gas.

Notes:
1. Emissions from ERCOT market purchases is included.
2. ERCOT-average CO2 emissions intensity in 2030 is projected to be 557 lb/MWh in REF, 650 in CBE, 504 in NZE, and 532 in VMA

CRA Charles River Associates

2030 NOX Emissions Intensity – By Scenario and Portfolio

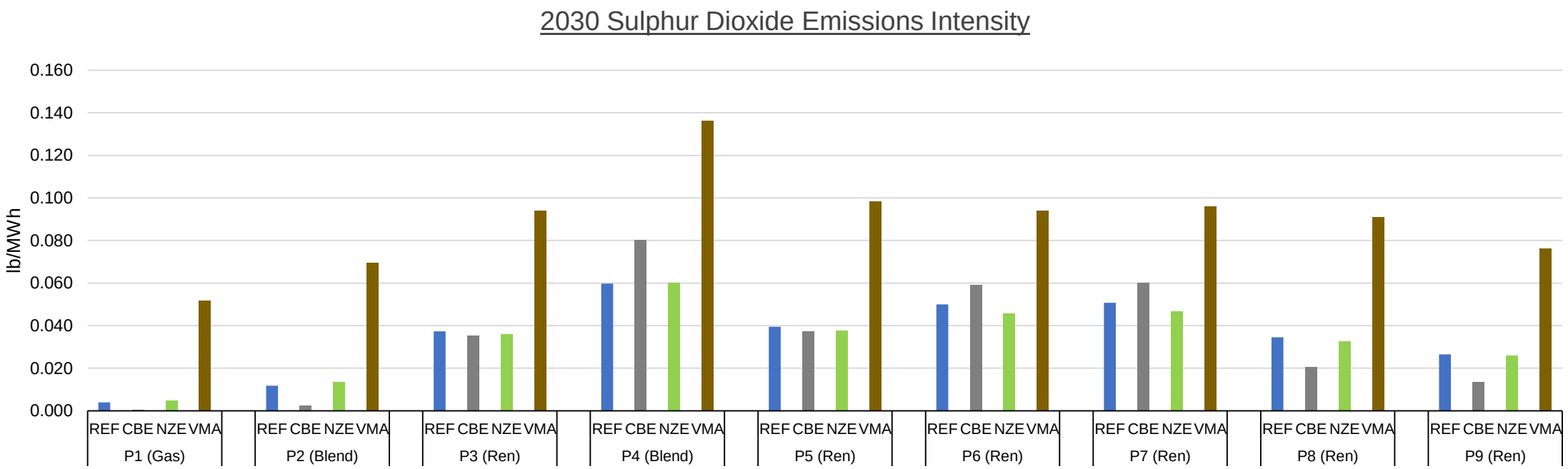


- NOX are produced from the combustion of all fossil fuels
- NOX emissions are generally higher in the CBE scenario due to higher utilization of gas power plants as a result of low gas prices
- Additions of new CPS Energy's gas capacity with lower NOX emission rates in late 2020s in P1 and P2 result in lower NOX emissions intensity in those portfolios relative to P8 and P9. P8 and P9 rely on existing CPS Energy's gas capacity, which has higher NOX emission rates than new gas plants, and higher ERCOT market purchases with higher NOX emissions intensity

Notes:
1. Emissions from ERCOT market purchases is included.
2. ERCOT-average NOX emissions intensity in 2030 is projected to be 0.22 lb/MWh in REF, 0.31 in CBE, 0.19 in NZE, and 0.27 in VMA

CRA Charles River Associates

2030 SO2 Emissions Intensity – By Scenario and Portfolio



- SO2 are produced from the combustion of coal
- Portfolios with higher market purchases have higher SO2 intensity, reflecting the ERCOT-average SO2 emissions intensity which is higher than the average SO2 emissions intensity of CPS Energy's generation fleet
- P4 has the highest SO2 emissions due to the continued running of both Spruce coal units through 2030 and beyond
- SO2 emissions are highest in VMA across all portfolios, reflecting the impact of market purchases from ERCOT which is projected to have high SO2 emissions intensity in the VMA scenario

Notes:
1. Emissions from ERCOT market purchases is included.
2. ERCOT-average SO2 emissions intensity in 2030 is projected to be 0.39 lb/MWh in REF, 0.51 in CBE, 0.30 in NZE, and 0.62 in VMA

CRA Charles River Associates