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APPLICATION OF SOUTHWESTERN PUBLIC SERVICE COMPANY TO AMEND ITS CERTIFICATE OF CONVENIENCE AND NECESSITY TO CONVERT HARRINGTON GENERATION STATION FROM COAL TO NATURAL GAS	**§ § § § § § §**	**PUBLIC UTILITY COMMISSION OF TEXAS**

DIRECT TESTIMONY

of

D. DEAN KOUJAK

on behalf of

SOUTHWESTERN PUBLIC SERVICE COMPANY

(*Filename:* Koujak.doc; *Total Pages: 30*)

Table of Contents

GLOSSARY OF ACRONYMS AND DEFINED TERMS

Acronym/Defined Term	Meaning
Harrington	Harrington Generation Station
IE	Independent Evaluator
Report	Independent Evaluator's Report on the Southwestern Public Service Company's Analysis of Harrington Options
RFI	Request for Information
RFP	Request for Proposal
SPS	Southwestern Public Service Company, a New Mexico corporation
Tolk Analysis	Analysis related to the retirement of SPS's Tolk assets

LIST OF ATTACHMENT

Attachment	Description
DDK-1	Independent Evaluator Report of the Southwestern Public Service Company's Analysis of the Harrington Station Options (*File Name: Attachment DDK-1.pdf*)

DIRECT TESTIMONY
OF
D. DEAN KOUJAK

I. WITNESS IDENTIFICATION AND QUALIFICATIONS

Q. Please state your name and business address and job title.

A. My name is D. Dean Koujak. My business address is 685 Third Avenue, 14th Floor, New York, NY 10017. I am employed by Guidehouse, Inc. as Director in the Energy, Sustainability, and Infrastructure segment.

Q. On whose behalf are you testifying in this proceeding?

A. I am filing testimony on behalf of Southwestern Public Service Company, a New Mexico corporation ("SPS") and wholly-owned electric utility subsidiary of Xcel Energy Inc.

Q. Please summarize your educational and professional background.

A. I have over 17 years of experience in the electric power sector, all of which was while employed with Guidehouse, Inc. and a predecessor firm, Navigant Consulting, Inc. During this time, I have worked predominantly with utilities covering power procurement, generation and transmission resource acquisition, and resource planning across the U.S. and Canada. I have served in a variety of capacities providing independent oversight on behalf of public utilities commissions across the U.S., including as an Independent Evaluator ("IE"), Observer, Monitor and Auditor. I hold a BS in Engineering Management from NYIT, an MBA from SUNY Stony Brook, and JD from Hofstra University.

Q. Have you testified before any regulatory authorities?

A. Yes, I have provided testimony in the states of Arizona, Michigan, Hawaii, Minnesota, and South Carolina related to utility competitive procurement of generation resource acquisition. Further, I have supported the development of testimony in multiple instances in Ohio related to utility competitive procurement of renewable energy.

II. PURPOSE AND SUMMARY OF TESTIMONY

Q. What is the purpose of your testimony in this proceeding?

A. The purpose of my testimony is to address Guidehouse's role and conclusions as the IE of the scope, execution, and results of SPS's Request for Information ("RFI") related to generation alternatives for coal-fired units at Harrington Station ("Harrington").

Q. Was Attachment DDK-1 prepared by you or under your direct supervision and control?

A. Yes.

III. BACKGROUND

Q. Describe your experience with utility solicitations for generation resources.

A. Over the past 17 years, I have worked with over 16 utilities and public utility commissions across the United States and Canada on matters pertaining to generation resource acquisition. I have designed, developed, and administered requests for proposals ("RFP") and RFIs for thermal and renewable generation, in addition to conducting the full evaluation of proposals. In addition, I have served in an oversight role overseeing the conduct of procurements administered by utilities.

Q. Does Guidehouse have any prior experience serving as an IE related to generation resources?

A. Yes. We have served as an IE, Monitor, Observer, and Auditor on multiple RFPs covering resource procurement for over six utilities.

Q. What role did Guidehouse play in the RFI process?

A. Based on commitments made by SPS in New Mexico, SPS agreed to hire an IE in order to perform the analysis related to the retirement of its Tolk assets ("Tolk Analysis"). SPS hired Guidehouse for the IE role related to Tolk. In September 2020, SPS issued an RFI to solicit bids for potential generating resources to replace Tolk as well as considering "a scenario in which all SPS's coal-burning units are retired or replaced before 2030." That necessarily includes retirement or replacement of the coal-fired units at Harrington. Guidehouse was then tasked with overseeing the RFI process and bids received from the RFI and the analysis conducted by SPS relating to the options for ceasing coal-fired operations at Harrington by December 31, 2024. Guidehouse prepared a report that analyzes these matters, which is titled

"Independent Evaluator's Report on the Southwestern Public Service Company's Analysis of Harrington Options" (the "Report"). The Report is presented as Attachment DDK-1.

Q. Is your compensation in this case related in any way to the conclusions or recommendations you make?

A. No. We are compensated for our services regardless of the conclusions or recommendations we are making.

IV. OVERVIEW OF RFI PROCESS

Q. Describe the goal of the RFI SPS issued on September 9, 2020.

A. The purpose of this RFI was to identify the potential and existing generation resources that market participants can make available to SPS that would provide capacity and associated energy to SPS to address the reliability needs driven by coal plant retirements.

Q. Why did SPS issue the RFI?

A. To perform the coal retirement analysis, SPS needed to understand the extent to which market participants can develop, construct, and bring to commercial operation generation resources within given timelines.

Q. What was the scope of the RFI?

A. The scope of the RFI was broad in that it solicited new-build and existing generation resources of all types, including solar, wind, and storage. In addition, it permitted any future commercial operation date available for new-build projects.

Q. Does the scope of the RFI relate to Harrington?

A. Yes. The RFI sought proposals from facilities that are within the SPS zone or delivered to the SPS zone in the Southwest Power Pool. The RFI was not constrained, from a design perspective, to meet particular requirements associated with the retirement of a specific generation resource. Under the Tolk Analysis that I mentioned previously, replacement generation resources are to be priced based on an RFI solicitation. Under the RFI solicitation, SPS noted that the Tolk Analysis would consider a scenario in which all of SPS's coal-burning units are retired or replaced before 2030, which includes Harrington. In summary, the resources submitted under

the Tolk RFI address the requirements that would need to be addressed under the analysis specific to Harrington.

Q. Was the RFI process conducted in a manner consistent with other RFIs you have observed?

A. Yes. The purpose of an RFI is to provide the issuing utility with information relating to market interest, capability, options, and pricing. To that end, RFIs are less formal than RFP processes and are intended to facilitate the receipt of information that enables a utility to make an informed decision on future resource planning. With this in mind, we sought to ensure that SPS clarified and sought additional information necessary from each proponent to better fit and address SPS's needs as necessary. In doing so, SPS would have the requisite information necessary to perform the required analyses under the Harrington study.

Q. Describe the responses that SPS received from bidders as a result of the RFI that provide generation options for Harrington.

A. SPS received responses from 18 bidders. Projects proposed included Solar, Wind, Solar coupled with Storage, Storage (various types), and Thermal Generation.

V. HARRINGTON ANALYSIS APPROACH AND METHODOLOGY

Q. What was SPS's approach to performing the economic analysis of replacement options?

A. SPS used a detailed supply optimization and production cost modeling tool called EnCompass. In doing so, the software would evaluate and model every option that SPS input into the model that meets the specified constraints. Use of a production cost modeling tool to evaluate alternative supply options is consistent with industry

practice. Typically, however, a utility would specify the specific expansion plan identifying, for example, the exact resources that would replace a retiring unit. The EnCompass software has the added benefit of identifying the most economically advantageous supply option by running every viable permutation that meets the specified constraints, returning the result that has the greatest economic benefit or least cost.

Q. On what basis were the results of the analysis ranked?

A. The results from the EnCompass software were tabulated on the basis of the Present Value of Revenue Requirements. Adoption of the revenue requirements comparative perspective is widely adopted in the industry, as this vantage point seeks to evaluate the relative costs passed onto ratepayers. In addition, levelizing the revenue requirements on the basis of net present value normalizes the results to then-present value at the beginning of the study period (in this case, 2022). This facilitates the comparison of options that may have greater short-term versus long-term cost implications, or vice versa. Levelization of the revenue requirements is also consistent with industry practices to ensure that the time value of money is considered and captured.

VI. GUIDEHOUSE REPORT

Q. Earlier, you mentioned that Guidehouse had prepared a Report. What are the contents of the Report?

A. The Report addresses Guidehouse's involvement in the Harrington Analysis, the scope of our review, the RFI process conducted as part of the Tolk Analysis and its applicability to Harrington, an overview of the scenarios evaluated, the analysis conducted by SPS, and our conclusions.

Q. What were your findings?

A. As noted in the Report, we observed that SPS used a fair solicitation and evaluation process and that SPS reasonably considered the viable replacement and retrofit options, and the applicable retirement date for Harrington.

Q. Does this conclude your pre-filed direct testimony?

A. Yes.

AFFIDAVIT

STATE OF NEW YORK)

)

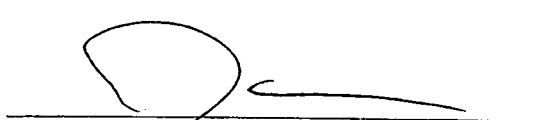
COUNTY OF WESTCHESTER)

D. DEAN KOUJAK, first being sworn on his oath, states:

I am the witness identified in the preceding testimony. I have read the testimony and the accompanying attachment(s) and am familiar with the contents. Based upon my personal knowledge, the facts stated in the testimony are true. In addition, in my judgment and based upon my professional experience, the opinions and conclusions stated in the testimony are true, valid, and accurate.

D. DEAN KOUJAK

Subscribed and sworn to before me this 23 day of August, 2021 by D. DEAN KOUJAK



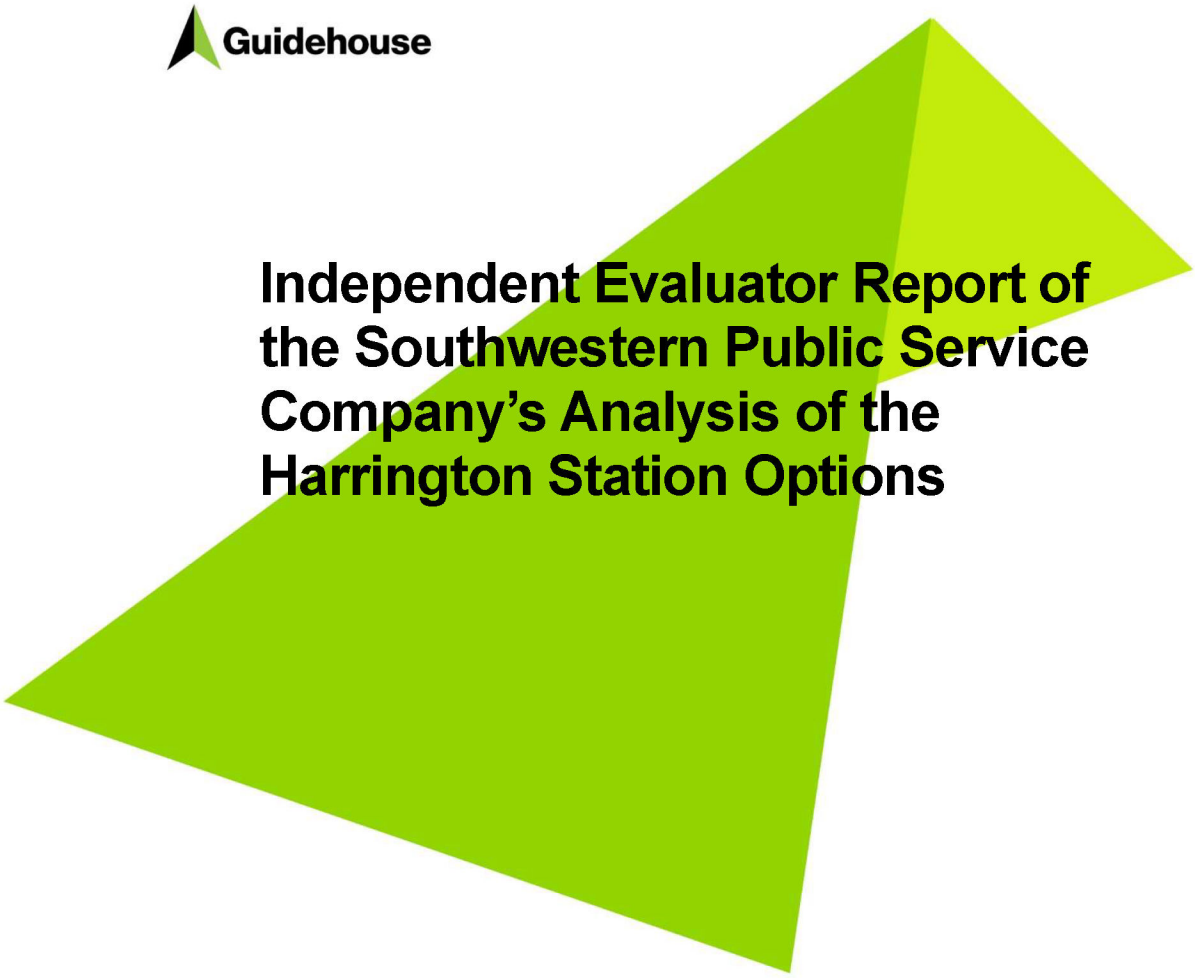
Notary Public, State of New York

JOSEPH ARCHINA
Notary Public, State of New York
No. 01AR6034577
Qualified in Westchester County
Exp. Date: 12/13/24

My Commission Expires: 12/13/24

CERTIFICATE OF SERVICE

I certify that August 27, 2021 this instrument was filed with the Public Utility Commission of Texas and a true and correct copy of it was served on the Staff of the Public Utility Commission of Texas, the Office of Public Utility Counsel, and all parties in SPS's current base rate proceeding, PUC Docket No. 51802, by hand delivery, Federal Express, certified mail, electronic mail, or facsimile transmission.



Independent Evaluator Report of the Southwestern Public Service Company's Analysis of the Harrington Station Options

Submitted by:

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Reference No.: 214834
July 16, 2021

Table of Contents

1. Background

Guidehouse Inc. was selected as the independent evaluator (IE) to oversee the Southwestern Public Service Company (SPS) Tolk Analysis pursuant to the Uncontested Comprehensive Stipulation (the Stipulation) filed at the New Mexico Public Regulation Commission on January 13, 2020, and approved by the New Mexico Public Regulation Commission in Case No. 19-00170-UT. Under the Stipulation, SPS is required to submit a robust analysis of both:

- Abandonment of its Tolk Generating Station Units 1 and 2
- Consideration of a scenario in which all SPS's coal-burning units are retired or replaced before 2030

As an extension of the Tolk Analysis, SPS undertook an additional analysis of reviewing the options to replace, retrofit, or repower the Harrington Generating Station (Harrington) to meet and maintain compliance with sulfur dioxide (SO_2) emissions limitations set by the National Ambient Air Quality Standards (NAAQS). Harrington is a 1,050 MW coal-fired power station located in Amarillo, Texas. The capacity provided by the power station supports the reliability of the grid by providing the power necessary to meet the coincident peak demand of SPS's customers. However, Harrington is not in compliance with NAAQS with respect to SO_2, with a regulatory deadline established by the Texas Commission on Environmental Quality of January 1, 2025 to come into compliance.

Retrofit, retirement by the end of 2024, and subsequent replacement options of Harrington are based largely on common assumptions shared with the Tolk Analysis. As part of the analysis, a request for information (RFI) process was initiated to provide SPS with information relating to availabilities, flexibilities, and preferences from the market participants in terms of providing capacity and associated energy from all available generating resource types. This information is key in determining whether there are feasible and economic opportunities to replace Tolk and all other coal-fired power plants. Contractual options to replace Tolk and other generating stations include build-own-transfers (BOTs) and power purchase agreements (PPAs), with pricing based on information obtained from the RFI process.

2. Scope of Review

Guidehouse's role as the IE was to effectively ensure the fairness, transparency, clarity, and prudence of the process undertaken to evaluate the options to bring Harrington into NAAQS compliance. In this report, we review and discuss:

- Whether SPS conducted an evaluation of potential retirement dates
- Whether SPS considered available replacement resources
- Whether SPS used fair solicitation and evaluation processes

To facilitate this review, SPS worked cooperatively with Guidehouse as the IE and provide us access to all documents and information leveraged by the utility in the preparation of its plan and in its bid solicitation, evaluation, and selection processes. SPS also was required to provide the bid evaluation results and modeling runs so that we could verify the results and investigate any options the utility did not consider.

In the following sections of this report, we outline our review of SPS's process to evaluate the options to replace and/or retrofit Harrington, starting with the RFI process.

3. RFI Process

SPS released the 2020 Request for Information for Generating Resources (the RFI) on September 9, 2020. Under the RFI, SPS solicited interest from existing or proposed generating facilities within or delivered to the SPS zone. The RFI was open to generating facilities providing capacity and associated energy to SPS from all generating resource types, including energy storage, whether existing or yet-to-be constructed. Bidders were allowed to provide proposals with pricing options under the following arrangements: build-own-transfers (BOTs) and power purchase agreements (PPAs).

3.1 Design

The design of the RFI was consistent with similar solicitations with respect to its clarity and brevity. SPS established basic qualifications to participate in the RFI, as follows:

- Expressions of interest should be from existing or proposed generating facilities within the SPS zone or delivered to the SPS zone from existing or proposed sites within the Southwest Power Pool (SPP) territory.
- Expressions of interest should include a proposed commercial operation date (COD) if the submission is a future resource.
- Expressions of interest should include all capacity, energy, environmental attributes such as renewable energy credits, and other generation-related services.
- For purposes of this RFI, renewable energy refers to electrical power generated by solar, wind, biomass, or other commercially viable renewable energy technologies including energy storage.
- SPS is interested in the availability of capacity and associated energy resources for possible future-owned generation, BOTs, and PPAs.
- PPA durations should be 25 and 30 years.
- Interested parties should respond to the RFI within 60 days of issuance.

To participate in the RFI, bidders were requested to submit a completed Excel template containing the information necessary for SPS to model and evaluate supply options. The template requested information on the following:

- Company proposing the resource
- Bidder contact information
- General information on the project and its location
- Contract options proposed
- Pricing
- Interconnection details and cost information
- Performance and related technical specifications

In the RFI, SPS noted it would evaluate the following information:

- Project type, including technical characteristics.
- Project site location for delivery within (or to) the SPS system.
- Proposed COD for resource facilities responsive to this RFI; the impact a delay in the proposed COD would have on the pricing.
- Pricing and quantity in megawatts.
- Current interconnection status (if any) and anticipated extent of need for transmission system upgrades for the proposal.
- Impact of available tax credits on proposed projects.
- Proposals must demonstrate an anticipated ability to obtain all required state/local preconstruction approvals and any associated risks to meet the COD.

From our perspective, the primary objective of an RFI process is to solicit a response from market participants that responds to a specific need to the maximum extent possible. To achieve this result, an RFI should have:

- Eligibility requirements that are not unduly restrictive.
- A relatively low burden to participate, limited only to information absolutely necessary for a utility to carry out its analysis.

In the RFI's design, the eligibility to participate was open to both existing and future resources from all generating resource types. Forms provided to market participants were designed to elicit a response from thermal, renewable, and storage resources. Furthermore, the response forms, which encapsulate the entire information request, contain information that is required to conduct the analysis. We view the information request under the RFI to not carry a significant burden to market participants to propose a response.

3.2 Process

SPS posted the RFI and associated materials on its website, available at https://www.xcelenergy.com/working_with_us/tolk_request_for_information. To introduce the RFI and answer questions from potential respondents, a bidders meeting was held by SPS on September 21, 2020. During the meeting, bidders were given an opportunity to address questions directly to SPS. Questions were also received from bidders directly via e-mail to the RFI inbox. During the pendency of the RFI up to the bid submission due date of 4:00 p.m. Mountain Daylight Time on Friday, November 6, 2020, SPS received and posted responses to questions both on its website and directly to the inquiring bidder.

Proposals were initially reviewed for completeness. SPS issued several rounds of clarifying questions to secure the information necessary to evaluate the options needed. With our concurrence and at our behest, to the extent that bidders did not include optimal COD dates or configurations that would better address SPS's needs, SPS issued additional clarifications requesting such options.

Certain projects were excluded from further analysis. They included projects that were voluntarily withdrawn by the proponents and those that proscribed a timeline for selection that

was too soon, primarily by 2022, to be valid. Exclusion of projects that require immediate contracting, where it is not feasible under the regulatorily established timeline, is appropriate and maintains fairness to all market participants. If SPS were to accelerate the timeline to accommodate a single project or set of projects, this would not be consistent with fairness.

From our perspective, the purpose of an RFI (and not a Request for Proposals ("RFP")) is to fully evaluate all potential available resource options. To the extent modifications to the COD dates and the project configuration better aligns the proposal to the underlying need, it better enables SPS to conduct a full and complete analysis of replacement options and resources. Based on industry practice, RFIs are intended to serve a discovery purpose and inform the development of future RFPs, which would be subject to more rigid processes and rules. RFIs are intended to be flexible in design to facilitate the acquisition of the kind of information that the issuing utility seeks to better understand. In the context of the current solicitation, our expectation would be for SPS to explore each proposal and maximize the amount of information obtained in the process. As the RFI was open-ended by design, some proposals are expected to be misaligned with SPS's system needs and require certain adjustments to maximize the potential benefit of their offer. Requesting additional pricing options and configurations would be the appropriate course of action for SPS to fully consider all options available. To that end, we observed SPS requesting additional pricing options from bidders to reflect different COD dates and interconnection assumptions. In doing so, the modeling reflected additional alternatives that may or may not have conferred economic benefits. Accordingly, we observed that SPS conducted the RFI process in a fair and complete fashion that is in-line with the intent of the solicitation and overall process.

3.3 Results

The RFI received the following response from the market:

- 18 companies participated.
- Eight key technologies proposed:
  - Solar
  - Solar plus storage
  - Wind
  - Gravitational energy storage
  - Combined cycle plus hydrogen storage
  - Liquid air energy storage
  - Flow energy storage
  - Compressed air battery
- Project deployment in five key states, including Texas, New Mexico, Colorado, Kansas, and Oklahoma.

Table 1. Summary of Responses Received

Bidders	Technology	States
Respondent 1	Solar	Texas
Respondent 2	Solar, solar plus storage	New Mexico
Respondent 3	Wind	New Mexico
Respondent 4	Solar plus storage	Texas
Respondent 5	Gravitational energy storage	N/A
Respondent 6	Wind	New Mexico, Colorado, Kansas
Respondent 7	Combined cycle plus hydrogen storage	Texas
Respondent 8	Wind	Texas
Respondent 9	Liquid air energy storage	N/A
Respondent 10	Solar, Wind	Texas
Respondent 11	Combined cycle	New Mexico
Respondent 12	Flow energy storage	N/A
Respondent 13	Solar, solar plus storage	Texas
Respondent 14	Wind, solar	New Mexico, Texas
Respondent 15	Solar plus storage, wind	Texas
Respondent 16	Technical Information on Resource Technology	N/A
Respondent 17	Solar	Oklahoma
Respondent 18	Compressed air battery	N/A

4. Replacement Options Modeling

To effectively evaluate replacement options for Harrington, SPS employs the use of a detailed modeling tool, which leverages information obtained during the RFI process in conjunction with system information to evaluate the optimal paths forward from an economic merit perspective. For example, if a coal-fired resource is required to retire at a certain date, the model evaluates all replacement options and determines which of the options, as a portfolio or standalone resource, makes economic sense while maintaining adequate reliability (reserve margin).

SPS utilized EnCompass for the Harrington analysis. EnCompass is a power supply planning software that performs the following computations:

- Production cost modeling that determines which electric system resources should be run on a least-cost basis, while respecting known constraints under a set of defined assumptions.
- Optimization of supply resources that, through permutative production cost analyses, identifies the supply portfolio that minimizes total cost while managing to reliability constraints.

A wide variety of tools are available in the marketplace to conduct the analysis. Based on a review of EnCompass' capabilities and the methodology it follows to perform the analysis, we agree with its use as part of the overall approach to optimize the solution. However, in large part, the modeling is sensitive to the following parameters, which are input manually:

- Specific scenarios and constraints, around which the model must solve for.
- Input assumptions on which the model calculates the cost of electric production.

The results from the EnCompass software were tabulated on the basis of the Present Value of Revenue Requirements ("PVRR"). Adoption of the revenue requirements comparative perspective is widely adopted in the industry, as this vantage point seeks to evaluate the relative costs passed onto ratepayers. In addition, levelizing the revenue requirements on the basis of net present value normalizes the results to present day dollars ($2022) to facilitate the comparison of options that may have greater short-term versus long-term cost implications. Levelization of revenue requirements is also consistent with industry practices to ensure that the time value of money is considered and captured.

Part of our role as IE is to reasonably ensure SPS evaluates all feasible and practical options to address the constraints and that the assumptions taken are reasonable and aligned with industry practice.

4.1 Assumptions

1. **Fuel price forecasts:** SPS inputs a natural gas forecast and coal price forecast into the EnCompass model. The approach to arriving at a consensus fuel price forecast generally entails the weighting or averaging of multiple leading price forecasts available in the market. The coal price forecast leverages specific price information associated with the power plants, which is reasonable given the impact of transportation-related costs, as well as the use of spot coal price forecasts developed by averaging market forecasts provided by industry-leading consulting firms. For natural gas, SPS adopts the

short-term outlook from NYMEX (plus 2 years) and adopts the longer-term outlook from an average of four publications (NYMEX, IHS Energy, S&P Global, and Wood Mackenzie). Guidehouse's market modeling experts have reviewed this approach and confirm that it benchmarks well to our internal forecasts. High and low gas price forecasts were also developed for the purpose of testing the sensitivity of the analysis to the gas price assumption. On similar engagements, we have observed similar approaches used by other utilities. We conclude that the methodology used for the applicable fuel price forecasts is reasonable.

2. **Market electricity prices:** SPS is a member of SPP, which gives it access to a regional market for electricity purchases and sales. To estimate applicable electric prices at which SPS can economically transact, SPS leverages a straight average of long-term on-peak and off-peak implied heat rate forecasts provided by Wood Mackenzie, S&P Global, and IHS Markit for SPP South Hub. Implied heat rates are a gauge of electrical efficiency denominated in MMBtu of natural gas consumption per kilowatt-hour of generation that are equivalent to what would be the breakeven point for power supply. Implied heat rates are multiplied by the gas price forecast to produce an equivalent market energy price. The SPP South Hub is the applicable region at which SPS can conduct electricity transactions. Guidehouse's market modeling experts have reviewed this approach and confirm that it benchmarks well to our internal forecasts. On similar engagements, we have observed similar approaches used by utilities. We conclude that the methodology used for the applicable market electricity price forecast is reasonable.
3. **Load and demand:** To meet regional reliability criteria and to project the energy needs of the SPS service territory, a proper projection of future energy sales and the coincident peak demand is needed for modeling purposes. SPS's methodology entails a forecast of retail energy sales and customers by rate class. Coincident peak demand is forecast at the aggregate SPS level. For customers receiving wholesale service, energy sales and coincident peak demand forecasts are developed according to the individual customer. In large part, SPS used actual monthly historical data to derive all forecasts. As part of the process, two forecasts were derived to conduct sensitivity: the planning forecast based on an 85% probabilistic load forecasting level and a financial forecast, which reflects actual expected load. The purpose of a planning forecast is to ensure reliability even during the worst-case scenario. Planning to this level achieves, typically, a 1 day in 10-year loss of load expectation, which is the standard set by the North American Electric Reliability Corporation that SPS must follow. In addition, the financial forecast reflects what the utility, financially, would realize in a given year based on a median expectation of load conditions. We have reviewed SPS's actual load forecasts and have benchmarked it to our available and modeled forecasts. Based on the review, we conclude that the load and demand forecasts are reasonable and in line with industry practice.
4. **Interconnection cost:** How a resource is connected to the system can have significant bearing on the all-in cost of a generation resource. In addition to the physical connection of the resources, there may be additional costs related to reinforcing the network of the broader area to assure reliable delivery of electricity. For SPS, interconnection studies are conducted by SPP, which receives interconnection requests from resources, groups studies for processing, manages the order in which projects are studied, conducts technical analyses to assure reliable connection, and assigns costs of network infrastructure upgrades required to reliably deliver electricity from the projects. A full and complete study can take a significant amount of time—approximately 18 months for the technical analysis. Constructing the interconnection and identified infrastructure

upgrades can take years, putting projects with existing interconnection requests at a significant timing advantage over ones that do not have an existing interconnection request. SPS developed cost adders based on upgrades identified for Zones 2 and 6, the relevant regions for SPS territory. By using the SPP estimates, SPS calculated the infrastructure cost adder to connect a resource as $400/kW in its base case. In addition, SPS ran additional sensitivities of $200/kW and $600/kW to determine the impact of higher or lower than expected interconnection costs than anticipated. This is a reasonable approach and in line with standard industry practices.

4.2 Scenarios

Scenario modeling was conducted to stress test the modeling. The primary constraint around which the SPS scenarios were built for Harrington is the 2025 compliance deadline to bring Harrington into SO_2 compliance with the NAAQS. SPS evaluated the following scenarios to determine the optimal path forward:

- **Conversion to natural gas:** This is the base scenario where Harrington is converted from a coal-fired steam turbine to a natural gas-fired steam turbine.
- **Partial conversion to natural gas:** In these two scenarios, only 1 or 2 units of the total 3 units are converted from coal to gas fuel. The remaining units are retired.
- **Installation of a dry sorbent injector (DSI):** To bring Harrington into compliance with NAAQS, this scenario entails the installation of a DSI on all Harrington units to reduce SO_2 emissions. Under this scenario, Harrington would continue to operate as a coal-fired resource.
- **Installation of spray dryer absorption (SDA):** To bring Harrington into compliance with NAAQS, this scenario entails the installation of an SDA on all Harrington units to reduce SO_2 emissions. Under this scenario, Harrington would continue to operate as a coal-fired resource.
- **Retirement of Harrington:** Under this scenario, Harrington is completely retired by the end of 2024. Replacement capacity is sourced from eligible RFI bids in addition to the installation of a new, generic replacement capacity resource (natural gas combustion turbine) that operates at a higher efficiency compared to a steam turbine but at a higher capital expenditure (CAPEX).

As part of our scope, we opine on whether SPS has considered the options available to address the 2025 compliance date to meet the SO_2 NAAQS standards. Two primary constraints limit supply options to meet this 2025 compliance date:

- Retrofit options available to bring Harrington into compliance.
- Ability and feasibility for the market to supply sufficient capacity and energy resources to replace the subject unit, as an alternative.

With respect to the retrofit options available for a coal-fired steam turbine, there are two general approaches: 1) installation of a scrubber or 2) fuel conversion. In the industry, a scrubber refers to the process of removing acid gas emissions from coal, including SO_2. In this case, SPS has evaluated two scrubber retrofit options: the DSI and SDA. DSI refers to "the practice of injecting

a dry alkaline mineral into a flue gas stream to reduce acid gas emissions."[1] DSI is a type of fluidized bed scrubber, where flue gas and alkaline mineral solids are mixed to react to remove acid gases. SDA is an alternative wet option where alkaline droplets are sprayed into the flue gas to absorb the acid gas. These two options are recognized as the main approaches to SO_2 mitigation if coal is maintained as the primary fuel. Therefore, modeling these two mitigation methods is reasonable. We do not see any other commercially viable options at this time.

The second general retrofit approach to mitigate SO_2 emissions is to convert the primary fuel from coal to oil or gas. Most utilities do not consider retrofit to oil because the cost of conversion is generally in the same range as gas; however, oil carries a higher transportation and supply cost compared to gas, which renders it comparatively uneconomical. Oil continues to have higher levels of SO_2 and nitrogen oxide (NOx) emissions compared to gas-fired generation. From a risk perspective, it carries a higher potential of becoming a stranded asset. With this in mind, only modeling a natural gas conversion is reasonable in our view. The utility further analyzed a scenario where the Harrington unit is partially converted. Under this scenario, new build units bid into the RFI could potentially replace part of the current capacity of Harrington but not all.

The scenarios outlined below, which involve conversion of Harrington to natural gas or retrofit with a scrubber, involve significant near-term capital expenditure. Results of the detailed modeling rely heavily on cost estimates to retrofit the plant. SPS contracted with Burns & McDonnell, a nationally recognized engineering firm, to provide an engineering, procurement, and construction (EPC) estimate of the cost to perform the coal scrubber retrofits. In our experience, contracting with a recognized engineering firm with experience in the power sector to produce an EPC estimate of retrofit options is a typical and reasonable practice. With regards to the gas conversion case, SPS leveraged an estimate developed by a third-party engineering firm, EN Engineering. The third-party firm provided a Total Installed Cost (TIC) estimate of the pipeline and related facilities and an overall schedule that included the design, permitting, ROW acquisition and construction phases of the project. SPS utilized this information along with estimating tools, and their knowledge of the facility to develop the Balance of Plant (BOP) and gas pipeline estimate for conversion. The buildup and overall cost of the gas conversion appear reasonable in terms of the methodology used to develop the estimate and the order of magnitude to effectuate a gas conversion of an existing coal facility.

[1] Institute of Clean Air Companies, *Dry Sorbent Injection for Acid Gas Control: Process Chemistry, Waste Disposal and Plant Operational Impacts*, July 2016, https://www.icac.com/resource/resmgr/white_papers/ICAC_Industrial_DSI_Ancillar.pdf.

5. Harrington Analysis

For each of the 6 (six) Harrington scenarios, the analysis was factored across two load forecasts (planning and financial) and three gas price forecasts (low, base, and high) for six total sensitivities per scenario. The base case analysis leveraged the planning load forecast, a $400/kW interconnection cost assumption, and the base case, median gas price forecast. Table 2~~Table 2~~ presents the results of the base cases:

Table 2. Summary of PVRR Results under Base Case Assumptions

Scenario #	Scenario Definition	PVRR ($M) 2022-2041	PVRR Delta to Sc. 2 ($M)	PVRR ($M) 2022-2024	PVRR Delta ($M) 2022-2024
1	Retirement by end of 2024	**$12,072**	$123	**$2,618**	$168
2	Harrington Coal-to-Gas Conversion – All 3 Units	**$11,949**	$0	**$2,450**	$0
3	Installation of a dry sorbent injector (DSI)	**$12,388**	$439	**$2,440**	($10)
4	Installation of spray dryer absorption (SDA)	**$12,644**	$695	**$2,440**	($10)
5	Harrington Coal-to-Gas Partial Conversion of 1 of 3 Units, Retire 2 units	**$12,011**	$62	**$2,542**	$92
6	Harrington Coal-to-Gas Partial Conversion of 2 of 3 Units, Retire 1 unit	**$11,944**	($5)	**$2,490**	$39

Guidehouse reviewed the model outputs from each of these scenarios, focusing on the key differences and their drivers among the cases to validate the analyses. We made the following observations:

- The key difference between the coal-to-gas conversion of Harrington versus retirement by the end of 2024 is twofold:
    - In the coal-to-gas conversion case, the required CAPEX reflects the installation of a 22-mile gas pipeline with the requisite capacity to supply Harrington. Harrington requires a minor amount of additional CAPEX to accommodate gas conversion as the plant has been previously outfitted with the appropriate nozzles. The retirement case, however, results in an immediate capacity deficiency that then triggers the installation of a new combustion turbine (CT) to maintain system reliability. In that case, the CT has a higher comparative CAPEX as compared to the coal-to-gas conversion.
    - The CT has an overall higher efficiency compared to Harrington and, therefore, has lower variable fuel costs.
- Between the DSI and SDA cases, which involve two different approaches to scrubbing acid gas emissions including SO_2, the sole difference between these cases is the differential in the CAPEX and associated recovery. The DSI case has a comparative advantage in terms of cost.

Prudent utility practice would suggest the cases be tested under a variety of conditions to stress test the cases against changes in the assumptions. The two factors that have significant impact on modeling results are the load forecast, which sets the reliability margin/capacity need requirement, and the fuel price forecast, which may influence the relative economics of fossil units of varying efficiency against renewable resources. SPS conducted a sensitivity analysis of the six scenarios across two load forecasts and three fuel price forecasts for a total of 36 runs.

Table 3. Impact of Assumptions on Scenario Ranking

Load Case	Interconnection Cost Assumption	Gas Forecast	Best Scenario	Next Best Scenario
Financial	200	Base	5	6
Financial	400	Base	6	2
Financial	600	Base	6	2
Planning	200	Base	6	5
Planning[2]	***400***	***Base***	***6***	***2***
Planning	600	Base	6	2
Financial	200	High	1	6
Financial	400	High	6	2
Financial	600	High	6	2
Planning	200	High	6	1
Planning	400	High	6	2
Planning	600	High	6	2
Financial	200	Low	6	2
Financial	400	Low	6	5
Financial	600	Low	6	2
Planning	200	Low	6	2
Planning	400	Low	6	2
Planning	600	Low	6	2

Results of the sensitivity analyses reveal that the predominant top two ranked scenarios involve the coal-to-gas conversion of Harrington. In Scenario 2, retrofit of the entire unit to gas is contemplated. In Scenario 6, retrofit of 2 out of 3 units (~66% of the plant capacity) is contemplated. There are 4 instances where other scenarios rank in the top 2 spots – Scenario 5 is in the top spot in 1 of the 18 sensitivities, and Scenario 1 also is in the top spot for 1 of the 18 sensitivities. Scenario 1 involves the retirement of Harrington by the end of 2024, while Scenario 5 involves the conversion of just one of the three Harrington units. What we observe is the following:

- The planning load forecast gives the 2 or 3 unit Coal-to-Gas conversion of Harrington an advantage. This is driven primarily due to the additional capacity need to meet required reliability margins.

[2] Highlighted scenario denotes the base case.

- Lower interconnection cost assumptions improve the basis for new capacity resources, however, in most scenarios modelled it is insufficient to justify the retirement scenario. In an extreme scenario that considers the Financial load forecast scenario, a low interconnection cost of $200/kW, and a high gas price forecast, retirement of Harrington by the end of 2024 is top ranked as a newer, more efficient gas generating facility would be able to interconnect at lower total CapEx and burn less gas. In other scenarios, where any of the assumptions change, a gas conversion scenario for Harrington is top ranked.

- In many cases, the difference between Scenarios 6 and 2 are within the margin of error for modelling purposes. Differences between Scenario 6 and 2 across all sensitivity scenarios ranges between $5M to $55M, with an average difference of $25M over the 20-year study horizon.

Given the relative proximity of the results, the decision to convert the Harrington station partially or fully should carefully consider other qualitative factors and optionality. The results of the analysis show that either Scenarios 2 or 6 can be deemed prudent paths forward. However, from our experience, proceeding with a partial conversion in the near term would make full conversion impractical, but not technically impossible in the future.

6. Conclusions

We oversaw SPS throughout both the RFI process and the Harrington analysis. With regards to the RFI, the key objective from an IE's perspective was to ensure that all proposals were fully considered and that each respondent was given an equal and fair opportunity to submit additional information as needed to provide the utility with the most advantageous offer possible to the utility and its ratepayers, facilitating consideration of a viable economical option to replace the Harrington Generating Station. Based on our observations of the discussions between SPS and respondents, this standard has been met, and specifically for the RFI process, SPS used fair solicitation and evaluation processes. In our review, we observed SPS using a consistent methodology and approach to evaluate the options proposed.

Whether SPS considered available replacement resources was a function of both the responses to the RFI, reflecting projects already in development able to meet the need dates, and generic resource options that SPS has captured in its model as a backstop should there be a shortfall in future capacity needs. The projects received via the RFI were included in the detailed modeling. The generic resource inputs are also consistent with supply options typically considered and available to utilities seeking to address a capacity need. In addition to considering replacement resources, SPS considered the available retrofit options for the Harrington facility, which included repowering to natural gas and the retrofit installation of emissions scrubbers. Aside from what was considered and evaluated by SPS, there are no other reasonable and viable options to our knowledge.

The potential Harrington retirement dates, given the 2025 compliance date, are limited to that compliance year to afford sufficient time for replacement resources to come online. Therefore, there are no other plausible retirement scenarios prior to that date that are worth considering without untenable risk. As a result, we conclude that SPS has evaluated all potential retirement dates for Harrington.

In summary, the overall process undertaken by SPS to evaluate the Harrington replacement options is reasonable and consistent with industry practice. The RFI process, options for replacement of Harrington, and the applicable retirement date for coal operations as constrained by the NAAQS compliance deadline are all in-line with our expectations on similar analyses conducted by other Utilities. In evaluating the assumptions, process, and modeling, there is no evidence in our view that any particular scenario was unduly advantaged over another. The sensitivity analyses further provide evidence of the same, that the results are consistent and not influenced in any way by changes in the key assumptions. Given that resource selection decisions are left to the EnCompass optimization engine, this provides us further assurance that the modelled portfolio does not reflect any further constraints added by the Utility that could influence the results.