PUBLIC UTILITY COMMISSION OF TEXAS

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SIERRA CLUB

March 28, 2022

VIA ELECTRONIC FILING

Jasmine Kirkland
Public Utility Commission of Texas
Central Records
P.O. Box 13326
Austin, Texas 78711
512-936-7180

Re: PUCT Docket No. 52485, Application of Southwestern Public Service Company to Amend Its Certificate of Convenience and Necessity to Convert Harrington Generating Station from Coal to Natural Gas

Dear Ms. Kirkland:

This letter is to follow up on our correspondence regarding the public, unredacted Direct Testimony of Devi Glick and Exhibits filed on behalf of Sierra Club, filed March 25, 2022, Tracking Number BZESGKVV. As discussed, the Commission's interchange system was unable to process the filing, although Sierra Club submitted it before the 3:00 p.m. deadline on March 25, 2022. The original exhibit package apparently included Excel spreadsheets provided by Southwestern Public Power Service through discovery that were corrupted or unreadable. To rectify the filing, we have excised the Company's spreadsheets from our exhibit package. Per our discussion, enclosed please find a re-filed copy of the Exhibits to the Direct Testimony of Devi Glick on behalf of Sierra Club, originally filed on March 25, 2022. We have submitted the public, unredacted Direct Testimony of Devi Glick as part of a separate filing. If you have any questions or require any additional information, please to not hesitate to contact me.

Respectfully submitted,

Joshua Smith
Sierra Club
2101 Webster St., Suite 1300
Oakland, CA - 94612-3011

(415) 977-5660
joshua.smith@sierraclub.org

Synapse
Energy Economics, Inc.

Devi Glick, Principal Associate

Synapse Energy Economics I 485 Massachusetts Avenue, Suite 3 I Cambridge, MA 02139 I 617-453-7050
dglick@synapse-energy.com

PROFESSIONAL EXPERIENCE

Synapse Energy Economics Inc., Cambridge, MA. *Principal Associate*, June 2021- Present; *Senior Associate*, April 2019 – June 2021; *Associate*, January 2018 – March 2019.

Conducts research and provides expert witness and consulting services on energy sector issues. Examples include:

- Modeling for resource planning using PLEXOS and Encompass utility planning software to evaluate the reasonableness of utility IRP modeling.
- Modeling for resource planning to explore alternative, lower-cost and lower-emission resource portfolio options.
- Providing expert testimony in rate cases on the prudence of continued investment in, and operation of, coal plants based on the economics of plant operations relative to market prices and alternative resource costs.
- Providing expert testimony and analysis on the reasonableness of utility coal plant commitment and dispatch practice in fuel and power cost adjustment dockets.
- Serving as an expert witness on avoided cost of distributed solar PV and submitting direct and surrebuttal testimony regarding the appropriate calculation of benefit categories associated with the value of solar calculations.
- Reviewing and assessing the reasonableness of methodologies and assumptions relied on in utility IRPs and other long-term planning documents for expert report, public comments, and expert testimony.
- Evaluating utility long-term resource plans and developing alternative clean energy portfolios for expert reports.
- Co-authoring public comments on the adequacy of utility coal ash disposal plans, and federal coal ash disposal rules and amendments.
- Analyzing system-level cost impacts of energy efficiency at the state and national level.

Rocky Mountain Institute, Basalt, CO. August 2012 – September 2017
Senior Associate

- Led technical analysis, modeling, training and capacity building work for utilities and governments in Sub-Saharan Africa around integrated resource planning for the central electricity grid energy. Identified over one billion dollars in savings based on improved resource-planning processes.
- Represented RMI as a content expert and presented materials on electricity pricing and rate design at conferences and events.

- Led a project to research and evaluate utility resource planning and spending processes, focusing specifically on integrated resource planning, to highlight systematic overspending on conventional resources and underinvestment and underutilization of distributed energy resources as a least-cost alternative.

Associate

- Led modeling analysis in collaboration with NextGen Climate America which identified a CO2 loophole in the Clean Power Plan of 250 million tons, or 41 percent of EPA projected abatement. Analysis was submitted as an official federal comment which led to a modification to address the loophole in the final rule.
- Led financial and economic modeling in collaboration with a major U.S. utility to quantify the impact that solar PV would have on their sales and helped identify alternative business models which would allow them to recapture a significant portion of this at-risk value.
- Supported the planning, content development, facilitation, and execution of numerous events and workshops with participants from across the electricity sector for RMI's Electricity Innovation Lab (eLab) initiative.
- Co-authored two studies reviewing valuation methodologies for solar PV and laying out new principles and recommendations around pricing and rate design for a distributed energy future in the United States. These studies have been highly cited by the industry and submitted as evidence in numerous Public Utility Commission rate cases.

The University of Michigan, Ann Arbor, MI. *Graduate Student Instructor*, September 2011 – July 2012

The Virginia Sea Grant at the Virginia Institute of Marine Science, Gloucester Point, VA. *Policy Intern*, Summer 2011

Managed a communication network analysis study of coastal resource management stakeholders on the Eastern Shore of the Delmarva Peninsula.

The Commission for Environmental Cooperation (NAFTA), Montreal, QC. *Short Term Educational Program/Intern*, Summer 2010

Researched energy and climate issues relevant to the NAFTA parties to assist the executive director in conducting a GAP analysis of emission monitoring, reporting, and verification systems in North America.

Congressman Tom Allen, Portland, ME. *Technology Systems and Outreach Coordinator*, August 2007 – December 2008

Directed Congressman Allen's technology operation, responded to constituent requests, and represented the Congressman at events throughout southern Maine.

EDUCATION

The University of Michigan, Ann Arbor, MI
Master of Public Policy, Gerald R. Ford School of Public Policy, 2012
Master of Science, School of Natural Resources and the Environment, 2012
Masters Project: *Climate Change Adaptation Planning in U.S. Cities*

Middlebury College, Middlebury, VT
Bachelor of Arts, 2007
Environmental Studies, Policy Focus; Minor in Spanish
Thesis: *Environmental Security in a Changing National Security Environment: Reconciling Divergent Policy Interests, Cold War to Present*

PUBLICATIONS

Addleton, I., D. Glick, R. Wilson. 2021. *Georgia Power's Uneconomic Coal Practices Cost Customers Millions*. Synapse Energy Economics for Sierra Club.

Glick, D., P. Eash-Gates, J. Hall, A. Takasugi. 2021. *A Clean Energy Future for MidAmerican and Iowa.* Synapse Energy Economics for Sierra Club, Iowa Environmental Council, and the Environmental Law and Policy Center.

Glick, D., S. Kwok. 2021 *Review of Southwestern Public Service Company's 2021 IRP and Tolk Analysis.* Synapse Energy Economics for Sierra Club.

Glick, D., P. Eash-Gates, S. Kwok, J. Tabernero, R. Wilson. 2021. *A Clean Energy Future for Tampa.* Synapse Energy Economics for Sierra Club.

Glick, D. *2021. Synapse Comments and Surreply Comments to the Minnesota Public Utility Commission in response to Otter Tail Power's 2021 Compliance Filing* Docket E-999/CI-19-704. Synapse Energy Economics for Sierra Club.

Eash-Gates, P., D. Glick, S. Kwok. R. Wilson. 2020. *Orlando's Renewable Energy Future: The Path to 100 Percent Renewable Energy by 2020.* Synapse Energy Economics for the First 50 Coalition.

Eash-Gates, P., B. Fagan, D. Glick. 2020. *Alternatives to the Surry-Skiffes Creek 500 kV Transmission Line.* Synapse Energy Economics for the National Parks Conservation Association.

Biewald, B., D. Glick, J. Hall, C. Odom, C. Roberto, R. Wilson. 2020. *Investing in Failure: How Large Power Companies are Undermining their Decarbonization Targets.* Synapse Energy Economics for Climate Majority Project.

Glick, D., D. Bhandari, C. Roberto, T. Woolf. 2020. *Review of benefit-cost analysis for the EPA's proposed revisions to the 2015 Steam Electric Effluent Limitations Guidelines.* Synapse Energy Economics for Earthjustice and Environmental Integrity Project.

Glick, D., J. Frost, B. Biewald. 2020. *The Benefits of an All-Source RFP in Duke Energy Indiana's 2021 IRP Process.* Synapse Energy Economics for Energy Matters Community Coalition.

Camp, E., B. Fagan, J. Frost, N. Garner, D. Glick, A. Hopkins, A. Napoleon, K. Takahashi, D. White, M. Whited, R. Wilson. 2019. *Phase 2 Report on Muskrat Falls Project Rate Mitigation, Revision 1 – September 25, 2019.* Synapse Energy Economics for the Board of Commissioners of Public Utilities, Province of Newfoundland and Labrador.

Camp, E., A. Hopkins, D. Bhandari, N. Garner, A. Allison, N. Peluso, B. Havumaki, D. Glick. 2019. *The Future of Energy Storage in Colorado: Opportunities, Barriers, Analysis, and Policy Recommendations.* Synapse Energy Office for the Colorado Energy Office.

Glick, D., B. Fagan, J. Frost, D. White. 2019. *Big Bend Analysis: Cleaner, Lower-Cost Alternatives to TECO's Billion-Dollar Gas Project*. Synapse Energy Economics for Sierra Club.

Glick, D., F. Ackerman, J. Frost. 2019. *Assessment of Duke Energy's Coal Ash Basin Closure Options Analysis in North Carolina.* Synapse Energy Economics for the Southern Environmental Law Center.

Glick, D., N. Peluso, R. Fagan. 2019. *San Juan Replacement Study: An alternative clean energy resource portfolio to meet Public Service Company of New Mexico's energy, capacity, and flexibility needs after the retirement of the San Juan Generating Station*. Synapse Energy Economics for Sierra Club.

Suphachalasai, S., M. Touati, F. Ackerman, P. Knight, D. Glick, A. Horowitz, J.A. Rogers, T. Amegroud. 2018. *Morocco – Energy Policy MRV: Emission Reductions from Energy Subsidies Reform and Renewable Energy Policy*. Prepared for the World Bank Group.

Camp, E., B. Fagan, J. Frost, D. Glick, A. Hopkins, A. Napoleon, N. Peluso, K. Takahashi, D. White, R. Wilson, T. Woolf. 2018. *Phase 1 Findings on Muskrat Falls Project Rate Mitigation.* Synapse Energy Economics for Board of Commissioners of Public Utilities, Province of Newfoundland and Labrador.

Allison, A., R. Wilson, D. Glick, J. Frost. 2018. *Comments on South Africa 2018 Integrated Resource Plan.* Synapse Energy Economics for Centre for Environmental Rights.

Hopkins, A. S., K. Takahashi, D. Glick, M. Whited. 2018. *Decarbonization of Heating Energy Use in California Buildings: Technology, Markets, Impacts, and Policy Solutions*. Synapse Energy Economics for the Natural Resources Defense Council.

Knight, P., E. Camp, D. Glick, M. Chang. 2018. *Analysis of the Avoided Costs of Compliance of the Massachusetts Global Warming Solutions Act*. Supplement to 2018 AESC Study. Synapse Energy Economics for Massachusetts Department of Energy Resources and Massachusetts Department of Environmental Protection.

Fagan, B., R. Wilson, S. Fields, D. Glick, D. White. 2018. *Nova Scotia Power Inc. Thermal Generation Utilization and Optimization: Economic Analysis of Retention of Fossil-Fueled Thermal Fleet to and Beyond 2030 – M08059*. Prepared for Board Counsel to the Nova Scotia Utility Review Board.

Ackerman, F., D. Glick, T. Vitolo. 2018. *Report on CCR proposed rule*. Prepared for Earthjustice.

Lashof, D. A., D. Weiskopf, D. Glick. 2014. *Potential Emission Leakage Under the Clean Power Plan and a Proposed Solution: A Comment to the US EP*A. NextGen Climate America.

Smith, O., M. Lehrman, D. Glick. 2014. *Rate Design for the Distribution Edge*. Rocky Mountain Institute.

Hansen, L., V. Lacy, D. Glick. 2013. *A Review of Solar PV Benefit & Cost Studies*. Rocky Mountain Institute.

TESTIMONY

Public Utility Commission of Texas (PUC Docket No. 52487): Direct Testimony of Devi Glick in the application of Entergy Texas Inc. to amend its certificate of convenience and necessity to construct Orange County Advanced Power Station. On behalf of Sierra Club. March 18, 2022.

Michigan Public Service Commission (Case No. U-21052): Direct Testimony of Devi Glick in the matter of the application of Indiana Michigan Power Company for approval of a Power Supply Cost Recovery Plan and Factors (2022). On Behalf of Sierra Club. March 9, 2022.

Arkansas Public Service Commission (Docket No. 21-070-U): Surrebuttal Testimony of Devi Glick in the Matter of the Application of Southwestern Electric Power Company for Approval of a General Change in Rate and Tariffs. On behalf of Sierra Club. February 17, 2022.

New Mexico Public Regulation Commission (Case No. 21-00200-UT): Direct Testimony of Devi Glick in the Matter of the Southwestern Public Service Company's Application to Amend its Certifications of Public Convince and Necessity to Convert Harrington Generation Station from Coal to Natural Gas. On behalf of Sierra Club. January 14, 2022.

Public Utilities Commission of Ohio (Case No. 18-1004-EL-RDR): Direct Testimony of Devi Glick in the Matter of the Review of the Power Purchase Agreement Rider of Ohio Power Company for 2018 and 2019. On behalf of the Office of the Ohio Consumer's Counsel. December 29, 2021.

Arkansas Public Service Commission (Docket No. 21-070-U): Direct Testimony of Devi Glick in the Matter of the Application of Southwestern Electric Power Company for Approval of a General Change in Rates and Tariffs. On behalf of Sierra Club. December 7, 2021.

Michigan Public Service Commission (Case No. U-20528): Direct Testimony of Devi Glick in the matter of the Application of DTE Electric Company for reconciliation of its power supply cost recovery plan (Case No. U-20527) for the 12-month period ending December 31, 2020. On behalf of Michigan Environmental Council. November 23, 2021.

Public Utilties Commission of Ohio (Case No. 20-167-EL-RDR): Direct Testimony of Devi Glick in the Matter of the Review of the Reconciliation Rider of Duke Energy Ohio, Inc. On behalf of The Office of the Ohio Consumer's Counsel. October 26, 2021.

Public Utilities Commission of Nevada (Docket No. 21-06001): Phase III Direct Testimony of Devi Glick in the joint application of Nevada Power Company d/b/a NV Energy and Sierra Pacific Power Company d/b/a NV Energy for approval of their 2022-2041 Triennial Intergrade Resource Plan and 2022-2024 Energy Supply Plan. On behalf of Sierra Club and Natural Resource Defense Council. October 6, 2021.

Public Service Commission of South Carolina (Docket No, 2021-3-E): Direct Testimony of Devi Glick in the matter of the annual review of base rates for fuel costs for Duke Energy Carolinas, LLC (for potential increase or decrease in fuel adjustment and gas adjustment). On behalf of the South Carolina Coastal Conservation League and the Southern Alliance for Clean Energy. September 10, 2021.

North Carolina Utilities Commission (Docket No. E-7, Sub 1250): Direct Testimony of Devi Glick in the matter of the application of Duke Energy Progress, LLC pursuant to N.C.G.S § 62-133.2 and commission R8-5 relating to fuel and fuel-related change adjustments for electric utilities. On behalf of Sierra Club. August 31, 2021.

Michigan Public Service Commission (Docket No. U-20530): Direct Testimony of Devi Glick in the application of Indiana Michigan Power Company for a Power Supply Cost Recovery Reconciliation proceeding for the 12-month period ending December 31, 2020. On behalf of the Michigan Attorney General. August 24, 2021.

Public Utilities Commission of Nevada (Docket No. 21-06001): Phase I Direct Testimony of Devi Glick in the joint application of Nevada Power Company d/b/a NV Energy and Sierra Pacific Power Company d/b/a NV Energy for approval of their 2022-2041 Triennial Intergrade Resource Plan and 2022-2024 Energy Supply Plan. On behalf of Sierra Club and Natural Resource Defense Council. August 16, 2021.

North Carolina Utilities Commission (Docket No. E-7, Sub 1250): Direct Testimony of Devi Glick in the Mater of Application Duke Energy Carolinas, LLC Pursuant to §N.C.G.S 62-133.2 and Commission Rule R8-5 Relating to Fuel and Fuel-Related Charge Adjustments for Electric Utilities. On behalf of Sierra Club. May 17, 2021.

Public Utility Commission of Texas (PUC Docket No. 51415): Direct Testimony of Devi Glick in the application of Southwestern Electric Power Company for authority to change rates. On behalf of Sierra Club. March 31, 2021.

Michigan Public Service Commission (Docket No. U-20804): Direct Testimony of Devi Glick in the application of Indiana Michigan Power Company for approval of a Power Supply Cost Recovery Plan and factors (2021). On behalf of Sierra Club. March 12, 2021.

Public Utility Commission of Texas (PUC Docket No. 50997): Direct Testimony of Devi Glick in the application of Southwestern Electric Power Company for authority to reconcile fuel costs for the period May 1, 2017- December 31, 2019. On behalf of Sierra Club. January 7, 2021.

Public Service Commission of Wisconsin (Docket No. 3270-UR-123): Surrebuttal Testimony of Devi Glick in the application of Madison Gas and Electric Company for authority to change electric and natural gas rates. On behalf of Sierra Club. September 29, 2020.

Public Service Commission of Wisconsin (Docket No. 6680-UR-122): Surrebuttal Testimony of Devi Glick in the application of Wisconsin Power and Light Company for approval to extend electric and natural gas rates into 2021 and for approval of its 2021 fuel cost plan. On behalf of Sierra Club. September 21, 2020.

Public Service Commission of Wisconsin (Docket No. 3270-UR-123): Direct Testimony and Exhibits of Devi Glick in the application of Madison Gas and Electric Company for authority to change electric and natural gas rates. On behalf of Sierra Club. September 18, 2020.

Public Service Commission of Wisconsin (Docket No. 6680-UR-122): Direct Testimony and Exhibits of Devi Glick in the application of Wisconsin Power and Light Company for approval to extend electric and natural gas rates into 2021 and for approval of its 2021 fuel cost plan. On behalf of Sierra Club. September 8, 2020.

Indiana Utility Regulatory Commission (Cause No. 38707-FAC125): Direct Testimony and Exhibits of Devi Glick in the application of Duke Energy Indiana, LLC for approval of a change in its fuel cost adjustment for electric service. On behalf of Sierra Club. September 4, 2020.

Indiana Utility Regulatory Commission (Cause No. 38707-FAC123 S1): Direct Testimony and Exhibits of Devi Glick in the Subdocket for review of Duke Energy Indian, LLC's Generation Unit Commitment Decisions. On behalf of Sierra Club. July 31, 2020.

Indiana Utility Regulatory Commission (Cause No. 38707-FAC124): Direct Testimony and Exhibits of Devi Glick in the application of Duke Energy Indiana, LLC for approval of a change in its fuel cost adjustment for electric service. On behalf of Sierra Club. June 4, 2020.

Arizona Corporation Commission (Docket No. E-01933A-19-0028): Rely to Late-filed ACC Staff Testimony of Devi Glick in the application of Tucson Electric Power Company for the establishment of just and reasonable rates. On behalf of Sierra Club. May 8, 2020.

Indiana Utility Regulatory Commission (Cause No. 38707-FAC123): Direct Testimony and Exhibits of Devi Glick in the application of Duke Energy Indiana, LLC for approval of a change in its fuel cost adjustment for electric service. On behalf of Sierra Club. March 6, 2020.

Public Utility Commission of Texas (PUC Docket No. 49831): Direct Testimony of Devi Glick in the application of Southwestern Public Service Company for authority to change rates. On behalf of Sierra Club. February 10, 2020.

New Mexico Public Regulation Commission (Case No. 19-00170-UT): Testimony of Devi Glick in Support of Uncontested Comprehensive Stipulation. On behalf of Sierra Club. January 21, 2020.

Michigan Public Service Commission (Docket No. U-20224): Direct Testimony of Devi Glick in the application of Indiana Michigan Power Company for Reconciliation of its Power Supply Cost Recovery Plan. On behalf of the Sierra Club. December 31, 2019.

Nova Scotia Utility and Review Board (Matter M09420): Expert Evidence of Fagan, B, D. Glick reviewing Nova Scotia Power's Application for Extra Large Industrial Active Demand Control Tariff for Port Hawkesbury Paper. Prepared for Nova Scotia Utility and Review Board Counsel. December 3, 2019.

New Mexico Public Regulation Commission (Case No. 19-00170-UT): Direct Testimony of Devi Glick regarding Southwestern Public Service Company's application for revision of its retail rates and authorization and approval to shorten the service life and abandon its Tolk generation station units. On behalf of Sierra Club. November 22, 2019.

North Carolina Utilities Commission (Docket No. E-100, Sub 158): Responsive testimony of Devi Glick regarding battery storage and PURPA avoided cost rates. On behalf of Southern Alliance for Clean Energy. July 3, 2019.

State Corporation Commission of Virginia (Case No. PUR-2018-00195): Direct testimony of Devi Glick regarding the economic performance of four of Virginia Electric and Power Company's coal-fired units and the Company's petition to recover costs incurred to company with state and federal environmental regulations. On behalf of Sierra Club. April 23, 2019.

Connecticut Siting Council (Docket No. 470B): Joint testimony of Robert Fagan and Devi Glick regarding NTE Connecticut's application for a Certificate of Environmental Compatibility and Public Need for the Killingly generating facility. On behalf of Not Another Power Plant and Sierra Club. April 11, 2019.

Public Service Commission of South Carolina (Docket No. 2018-3-E): Surrebuttal testimony of Devi Glick regarding annual review of base rates of fuel costs for Duke Energy Carolinas. On behalf of South Carolina Coastal Conservation League and Southern Alliance for Clean Energy. August 31, 2018.

Public Service Commission of South Carolina (Docket No. 2018-3-E): Direct testimony of Devi Glick regarding the annual review of base rates of fuel costs for Duke Energy Carolinas. On behalf of South Carolina Coastal Conservation League and Southern Alliance for Clean Energy. August 17, 2018.

Public Service Commission of South Carolina (Docket No. 2018-1-E): Surrebuttal testimony of Devi Glick regarding Duke Energy Progress' net energy metering methodology for valuing distributed energy resources system within South Carolina. On behalf of South Carolina Coastal Conservation League and Southern Alliance for Clean Energy. June 4, 2018.

Public Service Commission of South Carolina (Docket No. 2018-1-E): Direct testimony of Devi Glick regarding Duke Energy Progress' net energy metering methodology for valuing distributed energy resources system within South Carolina. On behalf of South Carolina Coastal Conservation League and Southern Alliance for Clean Energy. May 22, 2018.

Public Service Commission of South Carolina (Docket No. 2018-2-E): Direct testimony of Devi Glick on avoided cost calculations and the costs and benefits of solar net energy metering for South Carolina Electric and Gas Company. On behalf of South Carolina Coastal Conservation League and Southern Alliance for Clean Energy. April 12, 2018.

Public Service Commission of South Carolina (Docket No. 2018-2-E): Surrebuttal testimony of Devi Glick on avoided cost calculations and the costs and benefits of solar net energy metering for South Carolina Electric and Gas Company. On behalf of South Carolina Coastal Conservation League and Southern Alliance for Clean Energy. April 4, 2018.

Resume updated March 2022

PUBLIC UTILITY COMMISSION OF TEXAS

DOCKET NO. 52485

DG-2 - SPS Responses to Sierra Club's Interrogatories and Requests for Production of Documents

Exhibit #	Name	File
DG-2	SPS Response to SC RFI 1-3	PDF
DG-2	SPS Response to SC RFI 1-6	PDF
DG-2	SPS Response to SC RFI 1-7	PDF
DG-2	Exhibit 1-7(n)	PDF
DG-2	SPS Response to SC RFI 1-11	PDF
DG-2	SPS Response to SC RFI 1-12	PDF
DG-2	SPS Response to SC RFI 1-13	PDF
DG-2	Exhibit 1-13	PDF
DG-2	SPS Response to SC RFI 1-4(e)(i) - Encompass Cost Inputs – Partial Gas Conversion	PDF
DG-2	SPS Response to SC RFI 1-4(e)(i) - Encompass Cost Inputs – Early Retirement	PDF
DG-2	SPS Response to SC RFI 1-4(e)(i) - Encompass Cost Inputs – Gas Conversion	PDF
DG-2	SPS Response to SC RFI 2-3(a)	PDF
DG-2	SPS Response to SC RFI 3-1	PDF
DG-2	SPS Response to SC RFI 3-2	PDF
DG-2	SPS Response to SC RFI 3-4	PDF
DG-2	SPS Response to SC RFI 3-6	PDF
DG-2	SPS Response to SC RFI 3-7	PDF
DG-2	SPS Response to SC RFI 3-11	PDF
DG-2	SPS Response to SC RFI 3-12	PDF
DG-2	SPS Response to SC RFI 3-13	PDF
DG-2	SPS Response to SC RFI 3-14	PDF
DG-2	SPS Response to SC RFI 5-3	PDF
DG-2	SPS Response to SC RFI 1-3(ii), Attachment SO - _FF_SPS_HARRINGTON SO2_Gas 3	PDF

QUESTION NO. Sierra Club 1-3:

Please refer to the Direct Testimony of Ben R. Elsey at page 13. Please provide all Encompass and all Strategist modeling input and output files supporting SPS/Xcel's application and supporting testimony (in electronic, machine-readable format with formulae intact).

RESPONSE:

Please refer to Exhibit SPS-SC 1-3(i)(HS)(USB) for the EnCompass input and output files.

Please refer to Exhibit SPS-SC 1-3(ii) for the Strategist output files. The structure of the Strategist input files are proprietary to the vendor and can only be provided to active licensees of the Strategist software.

Preparer: Mark Christner, Ben R. Elsey
Sponsor: Ben R. Elsey

QUESTION NO. Sierra Club 1-6:

Has SPS/Xcel evaluated whether any of the Harrington units will require additional investments to comply with final, proposed, or possible future environmental regulations including, but not limited to: existing consent decrees, new source review provisions, coal combustion residuals, effluent limitation guidelines, national ambient air quality standards, cooling water intake standards, the cross-state air pollution rule, the mercury and air toxics standards, regional haze, and carbon dioxide emissions?

a. If not, please explain why not.
b. If so, please provide a summary, organized by electric generating unit, briefly describing the additional investments, including the purpose, and capital and annual O&M costs of such investments.
c. Please also include all supporting analyses, calculations, data, documents, modeling input and output files, and work papers associated with each investment.

RESPONSE:

Currently there are no other impending regulations that would be applicable to all three Harrington units other than the current SO2 National Ambient Air Quality Standards (NAAQS) requirements for which this gas conversion is being implemented. As stated in testimony by Mr. West, the current options to comply with the SO2 NAAQS standard involve the installation of SO2 controls, fuel conversion, retirement or some combination of these alternatives. The installation of SO2 controls would most likely require all three Harrington units to further comply with requirement in the Coal Combustion Residuals (CCR) rules. SPS beneficially uses 100% of its coal ash and is currently not subject to these requirements. The installation of SO2 controls would most likely render the majority if not all of the ash unusable for beneficial use and subject to these regulations.

The US Environmental Protection Agency (EPA) has also vacated the Affordable Clean Energy (ACE) rule for greenhouse gas regulations and will not be reinstating the former Clean Power Plan (CPP). It is SPS's understanding that the EPA intends to draft a new rule to replace the CPP. The contents of this rule are not known until published and cannot be evaluated until then.

There are no other known rules in any proposed or final state applicable to all three Harrington units that are not already incorporated into the operating permits for the facility. All three units are demonstrating compliance with these required operating permits.

Preparers: Jeff West
Sponsor: Jeff West

QUESTION NO. Sierra Club 1-7:

For the Harrington units, please provide the following historical annual data going back to 2015 - 2021, broken down by unit:

i. Installed Capacity
ii. Capacity factor
iii. Availability factor
iv. Heat Rate
v. Forced outage rate
vi. Fixed O&M costs
vii. Non-Fuel Variable costs
viii. Fuel Costs
ix. Environmental capital costs
x. Non-environmental capital costs
xi. Energy revenues (i.e., avoided energy purchase costs)
xii. Ancillary services revenues
xiii. Any other revenues
xiv. Depreciation
xv. Undepreciated net book value
xvi. Property taxes
xvii. Property insurance
xviii. Projected retirement date, if any.

RESPONSE:

i. Please refer to Exhibit SPS-SC 1-7(a-e). Please note that 2021 data for Harrington will not be available until after the year end.
ii. Please refer to Exhibit SPS-SC 1-7(a-e). Please note that 2021 data for Harrington will not be available until after the year end.
iii. Please refer to Exhibit SPS-SC 1-7(a-e). Please note that 2021 data for Harrington will not be available until after the year end.
iv. Please refer to Exhibit SPS-SC 1-7(a-e). Please note that 2021 data for Harrington will not be available until after the year end.
v. Please refer to Exhibit SPS-SC 1-7(a-e). Please note that 2021 data for Harrington will not be available until after the year end.
vi. Please refer to Exhibit SPS-SC 1-7(f-h). Please note that 2021 data for Harrington will not be available until after the year end.
vii. Please refer to Exhibit SPS-SC 1-7(f-h). Please note that 2021 data for Harrington will not be available until after the year end.
viii. Please refer to Exhibit SPS SC 1-7(f-h). Please note that 2021 data for Harrington will not be available until after the year end.
ix. Please refer to Exhibit SPS SC 1-7(i, j). Please note that 2021 data for Harrington will not be available until after the year end.

x. Please refer to Exhibit SPS SC 1-7(i, j). Please note that 2021 data for Harrington will not be available until after the year end.

xi. Please refer to Exhibit SPS-SC 1-7(k). Please note that 2021 data for Harrington will not be available until after the year end.

xii. Please refer to Exhibit SPS-SC 1-7(l). Please note that 2021 data for Harrington will not be available until after the year end.

xiii. Please refer to Exhibit SPS-SC 1-7(m). Exhibit represents annual coal ash revenue for Harrington. Please note, this information is not invoiced on a per unit basis.

xiv. Please refer to Exhibit SPS-SC 1-7(n).

xv. Please refer to SPS's response to subpart (n).

xvi. Please refer to Exhibit SPS-SC 1-7(p). Please note that 2021 data for Harrington will not be available until after the year end.

xvii. Xcel Energy does not allocate insurance costs to individual assets. The amount allocated to SPS is based on the replacement value of insurable SPS assets as it bears to the replacement value of insurable assets for the entire company. Amounts allocated to SPS are below:

	2016	2017	2018	2019	2020
SPS	$2,918,882	$2,774,425	$2,931,713	$3,514,302	$3,947,113

Please note that 2021 data for Harrington will not be available until after the year end.

xviii. SPS is not requesting a modification to the Commission approved retirement dates in this case. For Harrington Generating Station Units 1, 2, and 3, those dates are 2036, 2038, and 2040, respectively.

Preparers: Allison Johnson, Ryan Crotty, Sean Young, Jeff Comer
Sponsors: William A. Grant, Ben R. Elsey, Mark Lytal

SC 1-7n - Depreciation

Unit	As of : 12/31/2015	12/31/2016	12/31/2017	12/31/2018	12/31/2019	12/31/2020	6/30/2021
Harrington Common	$ 1,037,111	$ 1,070,952	$ 1,093,549	$ 1,103,644	$ 1,130,016	$ 1,732,058	$ 903,665
Harrington Unit 1	3,214,701	3,339,024	3,527,941	3,513,054	3,583,446	4,545,936	2,270,139
Harrington Unit 2	3,283,984	3,389,395	3,563,851	3,621,987	3,618,198	4,730,527	2,454,133
Harrington Unit 3	3,274,992	3,424,056	3,414,092	3,429,929	3,616,604	4,401,310	2,219,106
Harrington Common - Coal	-	-	-	-	-	-	177,460
Harrington Unit 1 - Coal	-	-	-	-	-	-	349,314
Harrington Unit 2 - Coal	-	-	-	-	-	-	313,180
Harrington Unit 3 - Coal	-	-	-	-	-	-	286,411
Total	**10,810,787**	**11,223,426**	**11,599,433**	**11,668,614**	**11,948,264**	**15,409,831**	**8,973,407**

SC 1-7o - Undepreciation Net Book Value (a)

Unit	As of : 12/31/2015	12/31/2016	12/31/2017	12/31/2018	12/31/2019	12/31/2020	6/30/2021
Harrington Common	24,259,646	24,770,137	24,734,514	23,929,376	27,280,194	10,423,757	9,661,972
Harrington Unit 1	64,073,446	75,113,651	76,262,615	72,088,884	68,452,041	60,639,832	58,732,717
Harrington Unit 2	72,839,066	75,798,513	84,399,420	80,928,565	74,995,763	73,998,083	72,470,578
Harrington Unit 3	71,354,373	68,689,605	66,462,954	70,930,529	72,292,897	73,240,001	71,166,452
Harrington Common - Coal	-	-	-	-	-	3,365,490	3,135,708
Harrington Unit 1 - Coal	-	-	-	-	-	8,813,183	8,496,149
Harrington Unit 2 - Coal	-	-	-	-	-	9,016,256	8,396,578
Harrington Unit 3 - Coal	-	-	-	-	-	8,556,063	8,243,614
Total	**232,526,532**	**244,371,906**	**251,859,502**	**247,877,354**	**243,020,894**	**248,052,665**	**240,303,767**

(a) Undepreciated Net Book Value excludes Land Owned (non-depreciable)

QUESTION NO. Sierra Club 1-11:

Please refer to the Direct Testimony of Ben R. Elsey at 8. Indicate whether SPS has considered securitization of other financing options as a way to minimize rate impacts from early retirement of the Harrington units

RESPONSE:

SPS is unaware of any legal authority permitting the securitization of the undepreciated balance of the Harrington units.

Preparer: Counsel
Sponsor: William A. Grant

QUESTION NO. Sierra Club 1-12:

Please refer to the Direct Testimony of Ben R. Elsey at 9. If SPS retired one Harrington unit at the end of 2024, and converted the other two, would the Company need additional replacement resources in 2024? Please explain.

RESPONSE:

No. SPS has sufficient generating resources to meet its planning reserve margin requirements in 2024. Retiring one Harrington Unit at the end of 2024 would have no impact on SPS's capability to meet its planning reserve margin requirements in 2024. However, retiring one Harrington unit at the end of 2024 would necessitate the need for additional replacement resources in subsequent years. Please refer to SPS's financial and planning forecast tables in Exhibit SPS-SC 1-13 for SPS's capacity need, with and without, one Harrington Unit.

Preparer: Ben R. Elsey
Sponsor: Ben R. Elsey

QUESTION NO. Sierra Club 1-13:

Please refer to the Direct Testimony of Ben Elsey at 8 and 18, discussing the need for replacement capacity if Harrington is retired, rather than repowered. Please state by year, through 2040, how much replacement capacity would be needed if SPS retired Harrington Unit One in 2024, while repowering units Two and Three. Please state whether your responses to this interrogatory are consistent with the Loads and Resources Table presented in SPS's most recent IRP, and if not, what is changed.

RESPONSE:

Please refer to Exhibit SPS-SC 1-13 for SPS's capacity need from 2025 to 2040, using SPS's most recent financial and planning load forecasts. Exhibit SPS-SC 1-13 assumes Harrington Unit 1 is retired at the end of 2024 and the remaining units are converted to operate on natural gas.

SPS is not required to file an integrated resource plan in Texas.

Preparers: Ashley Gibbons, Ben R. Elsey
Sponsor: Ben R. Elsey

Financial Forecast

	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
SPS Resource Position - Assuming all Harrington Units are Converted (MW)	**520**	**280**	**215**	**(39)**	**(193)**	**(224)**	**(507)**	**(783)**	**(1,894)**	**(2,489)**	**(2,861)**	**(2,942)**	**(3,328)**	**(3,365)**	**(3,769)**	**(3,820)**
Less Harrington 1 (MW)	(340)	(340)	(340)	(340)	(340)	(340)	(340)	(340)	(340)	(340)	(340)	(340)	0	0	0	0
SPS Resource Position - Assuming Harrington Unit 1 is retired (MW)	**180**	**(60)**	**(125)**	**(379)**	**(533)**	**(564)**	**(847)**	**(1,123)**	**(2,234)**	**(2,829)**	**(3,201)**	**(3,282)**	**(3,328)**	**(3,365)**	**(3,769)**	**(3,820)**

Planning Forecast

	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
SPS Resource Position - Assuming all Harrington Units are Converted (MW)	**148**	**(136)**	**(264)**	**(564)**	**(758)**	**(830)**	**(1,135)**	**(1,479)**	**(2,620)**	**(3,258)**	**(3,627)**	**(3,777)**	**(4,201)**	**(4,252)**	**(4,709)**	**(4,789)**
Less Harrington 1 (MW)	(340)	(340)	(340)	(340)	(340)	(340)	(340)	(340)	(340)	(340)	(340)	(340)	0	0	0	0
SPS Resource Position - Assuming Harrington Unit 1 is retired (MW)	(192)	(476)	(604)	(904)	(1,098)	(1,170)	(1,475)	(1,819)	(2,960)	(3,598)	(3,967)	(4,117)	(4,201)	(4,252)	(4,709)	(4,789)

Convert 2 Units to Gas / Retire 1 Unit

Capital Expenditure

Capital Expenditure for New Gas Pipeline

		2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total
Unit 0	$ 64,214,669	$ 2,994,181	$ 10,184,890	$ 48,506,446	$ 2,529,152	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 64,214,669
Total	**$ 64,214,669**	**$ 2,994,181**	**$ 10,184,890**	**$ 48,506,446**	**$ 2,529,152**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 64,214,669**

On-going Capital Expenditure

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total
Unit 0	$ 1,643,276	$ 1,883,409	$ 1,784,879	$ 843,750	$ 860,625	$ 877,838	$ 895,394	$ 913,302	$ 931,568	$ 950,200	$ 969,204	$ 988,588	$ 1,008,359	$ 1,028,527	$ 1,049,097	$ 1,070,079	$ 818,610	$ 417,491	$ -	$ 18,934,196
Unit 1	$ 818,524	$ 31,250	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 849,774
Unit 2	$ 133,000	$ 6,271,187	$ 1,500	$ 937,500	$ 956,250	$ 975,375	$ 994,883	$ 1,014,780	$ 1,035,076	$ 1,055,777	$ 1,076,893	$ 1,098,431	$ 1,120,399	$ 1,142,807	$ 874,248	$ 445,866	$ -	$ -	$ -	$ 19,133,972
Unit 3	$ 270,831	$ 353,500	$ 745,427	$ 937,500	$ 956,250	$ 975,375	$ 994,883	$ 1,014,780	$ 1,035,076	$ 1,055,777	$ 1,076,893	$ 1,098,431	$ 1,120,399	$ 1,142,807	$ 1,165,663	$ 1,188,977	$ 909,567	$ 463,879	$ -	$ 16,506,014
Total	**$ 2,865,630**	**$ 8,539,347**	**$ 2,531,806**	**$ 2,718,750**	**$ 2,773,125**	**$ 2,828,588**	**$ 2,885,159**	**$ 2,942,862**	**$ 3,001,720**	**$ 3,061,754**	**$ 3,122,989**	**$ 3,185,449**	**$ 3,249,158**	**$ 3,314,141**	**$ 3,089,008**	**$ 2,704,922**	**$ 1,728,178**	**$ 881,371**	**$ -**	**$ 55,423,956**

Fixed O&M

Fixed O&M

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total
Unit 1	$ 5,517,123	$ 5,849,857	$ 6,257,048	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 17,624,028
Unit 2	$ 5,517,123	$ 5,849,857	$ 6,257,048	$ 6,100,350	$ 5,737,857	$ 6,205,601	$ 5,933,837	$ 6,627,092	$ 6,002,057	$ 6,120,431	$ 6,242,840	$ 6,367,697	$ 6,495,051	$ 6,624,952	$ 6,757,451	$ 8,195,577	$ 8,359,488	$ -	$ -	$ 109,394,307
Unit 3	$ 5,517,123	$ 5,849,857	$ 6,257,048	$ 6,100,350	$ 5,737,857	$ 6,205,601	$ 5,933,837	$ 6,627,092	$ 6,002,057	$ 6,120,431	$ 6,242,840	$ 6,367,697	$ 6,495,051	$ 6,624,952	$ 6,757,451	$ 8,195,577	$ 8,359,488	$ 13,539,894	$ 13,810,692	$ 136,744,894
Total	**$ 16,551,369**	**$ 17,549,571**	**$ 18,771,143**	**$ 12,200,699**	**$ 11,475,714**	**$ 12,411,201**	**$ 11,867,674**	**$ 13,254,183**	**$ 12,004,115**	**$ 12,240,863**	**$ 12,485,680**	**$ 12,735,393**	**$ 12,990,101**	**$ 13,249,903**	**$ 13,514,901**	**$ 16,391,153**	**$ 16,718,976**	**$ 13,539,894**	**$ 13,810,692**	**$ 263,763,228**

**Ended up using coal FOM 2022 - 2024*

Fuel Handling / Gas Demand

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total
Unit 1	$ 5,634,599	$ 5,661,197	$ 5,688,459	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 16,984,255
Unit 2	$ 5,634,599	$ 5,661,197	$ 5,688,459	$ 2,100,000	$ 2,142,000	$ 2,184,840	$ 2,228,537	$ 2,273,108	$ 2,318,570	$ 2,364,941	$ 2,412,240	$ 2,460,485	$ 2,509,694	$ 2,559,888	$ 2,611,086	$ 2,663,308	$ 2,716,574	$ -	$ -	$ 50,529,525
Unit 3	$ 5,634,599	$ 5,661,197	$ 5,688,459	$ 2,100,000	$ 2,142,000	$ 2,184,840	$ 2,228,537	$ 2,273,108	$ 2,318,570	$ 2,364,941	$ 2,412,240	$ 2,460,485	$ 2,509,694	$ 2,559,888	$ 2,611,086	$ 2,663,308	$ 2,716,574	$ 2,770,905	$ 2,826,324	$ 56,126,754
Total	**$ 16,903,798**	**$ 16,983,591**	**$ 17,065,377**	**$ 4,200,000**	**$ 4,284,000**	**$ 4,369,680**	**$ 4,457,074**	**$ 4,546,215**	**$ 4,637,139**	**$ 4,729,882**	**$ 4,824,480**	**$ 4,920,969**	**$ 5,019,389**	**$ 5,119,777**	**$ 5,222,172**	**$ 5,326,616**	**$ 5,433,148**	**$ 2,770,905**	**$ 2,826,324**	**$ 123,640,534**

Pipeline O&M

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total
Unit 0	**$ -**	**$ -**	**$ -**	**$ 361,918**	**$ 369,156**	**$ 376,539**	**$ 384,070**	**$ 391,751**	**$ 399,586**	**$ 407,578**	**$ 415,730**	**$ 424,044**	**$ 432,525**	**$ 441,176**	**$ 449,999**	**$ 458,999**	**$ 468,179**	**$ 477,543**	**$ 487,094**	**$ 6,745,887**

Variable O&M

VO&M	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Unit 1	$ 1.21	$ 1.23	$ 1.26	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Unit 2	$ 1.21	$ 1.23	$ 1.26	$ 1.95	$ 1.99	$ 2.03	$ 2.07	$ 2.11	$ 2.15	$ 2.19	$ 2.24	$ 2.28	$ 2.33	$ 2.37	$ 2.42	$ 2.47	$ 2.52		
Unit 3	$ 1.21	$ 1.23	$ 1.26	$ 1.95	$ 1.99	$ 2.03	$ 2.07	$ 2.11	$ 2.15	$ 2.19	$ 2.24	$ 2.28	$ 2.33	$ 2.37	$ 2.42	$ 2.47	$ 2.52	$ 2.57	$ 2.62

Unit Cost - Online	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Cost per hour (per unit)	$ 34.13	$ 34.81	$ 35.51	$ 108.46	$ 110.63	$ 112.85	$ 115.10	$ 117.41	$ 119.75	$ 122.15	$ 124.59	$ 127.08	$ 129.62	$ 132.22	$ 134.86	$ 137.56	$ 140.31	$ 143.12	$ 145.98
Commodity Charge	$ -	$ -	$ -	$ 0.0183	$ 0.0187	$ 0.0190	$ 0.0194	$ 0.0198	$ 0.0202	$ 0.0206	$ 0.0210	$ 0.0214	$ 0.0219	$ 0.0223	$ 0.0228	$ 0.0232	$ 0.0237	$ 0.0241	$ 0.0246

Convert 1 Units to Gas / Retire 2 Units

38,300,000
52,600,000 72.81%

Capital Expenditure

Capital Expenditure for New Gas Pipeline

		2022	2023	2024	2025	2026
Unit 0	$ 46,757,069	$ 2,180,174	$ 7,415,994	$ 35,319,332	$ 1,841,569	$ -
Total	**$ 46,757,069**	**$ 2,180,174**	**$ 7,415,994**	**$ 35,319,332**	**$ 1,841,569**	**$ -**

On-going Capital Expenditure

	2022	2023	2024	2025	2026
Unit 0	$ 1,369,397	$ 1,569,508	$ 1,487,399	$ 703,125	$ 717,188
Unit 1	$ 818,524	$ 31,250	$ -	$ -	$ -
Unit 2	$ 66,500	$ 3,135,594	$ -	$ -	$ -
Unit 3	$ 270,831	$ 353,500	$ 745,427	$ 937,500	$ 956,250
Total	**$ 2,525,251**	**$ 5,089,851**	**$ 2,232,826**	**$ 1,640,625**	**$ 1,673,438**

Fixed O&M

Fixed O&M

	2022	2023	2024	2025	2026
Unit 1	$ 5,517,123	$ 5,849,857	$ 6,257,048	$ -	$ -
Unit 2	$ 5,517,123	$ 5,849,857	$ 6,257,048	$ -	$ -
Unit 3	$ 5,517,123	$ 5,849,857	$ 6,257,048	$ 6,100,350	$ 5,737,857
Total	**$ 16,551,369**	**$ 17,549,571**	**$ 18,771,143**	**$ 6,100,350**	**$ 5,737,857**

**Ended up using coal FOM 2022 - 2024*

Fuel Handling / Gas Demand

	2022	2023	2024	2025	2026
Unit 1	$ 5,634,599	$ 5,661,197	$ 5,688,459	$ -	$ -
Unit 2	$ 5,634,599	$ 5,661,197	$ 5,688,459	$ -	$ -
Unit 3	$ 5,634,599	$ 5,661,197	$ 5,688,459	$ 2,100,000	$ 2,142,000
Total	**$ 16,903,798**	**$ 16,983,591**	**$ 17,065,377**	**$ 2,100,000**	**$ 2,142,000**

Pipeline O&M

	2022	2023	2024	2025	2026
Unit 0	**$ -**	**$ -**	**$ -**	**$ 361,918**	**$ 369,156**

Variable O&M

VO&M	2022	2023	2024	2025	2026
Unit 1	$ 1.21	$ 1.23	$ 1.26	$ -	$ -
Unit 2	$ 1.21	$ 1.23	$ 1.26	$ -	$ -
Unit 3	$ 1.21	$ 1.23	$ 1.26	$ 1.95	$ 1.99

Unit Cost - Online	2022	2023	2024	2025	2026
Cost per hour (per unit)	$ 34.13	$ 34.81	$ 35.51	$ 108.46	$ 110.63
Commodity Charge	$ -	$ -	$ -	$ 0.0183	$ 0.0187

2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
$ 731,531	$ 746,162	$ 761,085	$ 776,307	$ 791,833	$ 807,670	$ 823,823	$ 840,299	$ 857,105	$ 874,248
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 975,375	$ 994,883	$ 1,014,780	$ 1,035,076	$ 1,055,777	$ 1,076,893	$ 1,098,431	$ 1,120,399	$ 1,142,807	$ 1,165,663
$ 1,706,906	**$ 1,741,044**	**$ 1,775,865**	**$ 1,811,383**	**$ 1,847,610**	**$ 1,884,562**	**$ 1,922,254**	**$ 1,960,699**	**$ 1,999,913**	**$ 2,039,911**

2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 6,205,601	$ 5,933,837	$ 6,627,092	$ 6,002,057	$ 6,120,431	$ 6,242,840	$ 6,367,697	$ 6,495,051	$ 6,624,952	$ 6,757,451
$ 6,205,601	**$ 5,933,837**	**$ 6,627,092**	**$ 6,002,057**	**$ 6,120,431**	**$ 6,242,840**	**$ 6,367,697**	**$ 6,495,051**	**$ 6,624,952**	**$ 6,757,451**

2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 2,184,840	$ 2,228,537	$ 2,273,108	$ 2,318,570	$ 2,364,941	$ 2,412,240	$ 2,460,485	$ 2,509,694	$ 2,559,888	$ 2,611,086
$ 2,184,840	**$ 2,228,537**	**$ 2,273,108**	**$ 2,318,570**	**$ 2,364,941**	**$ 2,412,240**	**$ 2,460,485**	**$ 2,509,694**	**$ 2,559,888**	**$ 2,611,086**

2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
$ 376,539	**$ 384,070**	**$ 391,751**	**$ 399,586**	**$ 407,578**	**$ 415,730**	**$ 424,044**	**$ 432,525**	**$ 441,176**	**$ 449,999**

2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 2.03	$ 2.07	$ 2.11	$ 2.15	$ 2.19	$ 2.24	$ 2.28	$ 2.33	$ 2.37	$ 2.42

2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
$ 112.85	$ 115.10	$ 117.41	$ 119.75	$ 122.15	$ 124.59	$ 127.08	$ 129.62	$ 132.22	$ 134.86
$ 0.0190	$ 0.0194	$ 0.0198	$ 0.0202	$ 0.0206	$ 0.0210	$ 0.0214	$ 0.0219	$ 0.0223	$ 0.0228

2037	2038	2039	2040	Total
$ -	$ -	$ -	$ -	$ 46,757,069
$ -	**$ -**	**$ -**	**$ -**	**$ 46,757,069**

2037	2038	2039	2040	Total
$ 891,733	$ 682,175	$ 347,909	$ -	$ 15,778,496
$ -	$ -	$ -	$ -	$ 849,774
$ -	$ -	$ -	$ -	$ 3,202,094
$ 1,188,977	$ 909,567	$ 463,879	$ -	$ 16,506,014
$ 2,080,709	**$ 1,591,743**	**$ 811,789**	**$ -**	**$ 36,336,379**

2037	2038	2039	2040	Total
$ -	$ -	$ -	$ -	$ 17,624,028
$ -	$ -	$ -	$ -	$ 17,624,028
$ 8,195,577	$ 8,359,488	$ 13,539,894	$ 13,810,692	$ 136,744,894
$ 8,195,577	**$ 8,359,488**	**$ 13,539,894**	**$ 13,810,692**	**$ 171,992,949**

2037	2038	2039	2040	Total
$ -	$ -	$ -	$ -	$ 16,984,255
$ -	$ -	$ -	$ -	$ 16,984,255
$ 2,663,308	$ 2,716,574	$ 2,770,905	$ 2,826,324	$ 56,126,754
$ 2,663,308	**$ 2,716,574**	**$ 2,770,905**	**$ 2,826,324**	**$ 90,095,264**

2037	2038	2039	2040	Total
$ 458,999	**$ 468,179**	**$ 477,543**	**$ 487,094**	**$ 6,745,887**

2037	2038	2039	2040
$ -	$ -	$ -	$ -
$ -	$ -		
$ 2.47	$ 2.52	$ 2.57	$ 2.62

2037	2038	2039	2040
$ 137.56	$ 140.31	$ 143.12	$ 145.98
$ 0.0232	$ 0.0237	$ 0.0241	$ 0.0246

Early Retirement

Capital Expenditure

On-going Capital Expenditure

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total
Unit 0	$ 912,931	$ 1,046,339	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,959,270
Unit 1	$ 818,524	$ 31,250	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 849,774
Unit 2	$ 66,500	$ 3,135,594	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3,202,094
Unit 3	$ 135,415	$ 176,750	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 312,165
Total	**$ 1,933,370**	**$ 4,389,932**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 6,323,303**

Fixed O&M

Fixed O&M

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total
Unit 1	$ 5,517,123	$ 5,849,857	$ 6,257,048	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 17,624,028
Unit 2	$ 5,517,123	$ 5,849,857	$ 6,257,048	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 17,624,028
Unit 3	$ 5,517,123	$ 5,849,857	$ 6,257,048	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 17,624,028
Total	**$ 16,551,369**	**$ 17,549,571**	**$ 18,771,143**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 52,872,083**

Fuel Handling / Gas Demand

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total
Unit 1	$ 5,634,599	$ 5,661,197	$ 5,688,459	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 16,984,255
Unit 2	$ 5,634,599	$ 5,661,197	$ 5,688,459	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 16,984,255
Unit 3	$ 5,634,599	$ 5,661,197	$ 5,688,459	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 16,984,255
Total	**$ 16,903,798**	**$ 16,983,591**	**$ 17,065,377**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 50,952,765**

Variable O&M

VO&M (Excluding associated DSI VOM)	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Unit 1	$ 1.21	$ 1.23	$ 1.26	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Unit 2	$ 1.21	$ 1.23	$ 1.26	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Unit 3	$ 1.21	$ 1.23	$ 1.26	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Unit Cost - Online	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Cost per hour (per unit)	$ 34.13	$ 34.81	$ 35.51	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Source: SPS's 2021 - 2025 Capital Budget (ending 2024 after gas conversion)
Escalation 2%

		Budgeted			
Unit	Project Name	2021	2022	2023	2024
HAR0	Annual Capital Expenditure	$ 3,660,269	$ 1,825,862	$ 2,092,677	$ 1,983,199
HAR1	Annual Capital Expenditure	$ 42,415	$ 1,637,048	$ 62,500	$ 387,173
HAR2	Annual Capital Expenditure	$ -	$ 133,000	$ 6,271,187	$ 1,500
HAR3	Annual Capital Expenditure	$ 11,133,637	$ 270,831	$ 353,500	$ 745,427
	Total	**$ 14,836,321**	**$ 3,866,741**	**$ 8,779,864**	**$ 3,117,299**

Plant	Project Name	2021	2022	2023	2024
HAR3	HAR3-H3 Upgrd Cntrls Support Stations	$19,250	$750	$0	$0
HAR1	HAR1-H1 Upgrd Cntrls Support Stations	$2,250	$22,750	$0	$0
HAR2	HAR2-H2 Upgrade Support Stations	$0	$0	$25,000	$0
HAR1	HAR1-H1 Inst MBFP wtr in oil detction	$32,000	$0	$0	$0
HAR3	HAR3-H3 Inst MBFP wtr in oil detction	$32,600	$0	$0	$0
HAR3	HAR3-H3 Install XFMR DGA	$53,968	$0	$0	$0
HAR0	HAR0-H0-Tool Blanket 2021	$58,752	$0	$0	$0
HAR0	HAR0-H0-Tool Blanket 2022	$0	$60,514	$0	$0
HAR1	HAR1-H1 Inst DGA	$0	$0	$61,000	$0
HAR3	HAR3-H3-Rpl Inst Air Dryer	$61,448	$0	$0	$0
HAR0	HAR0-H0-Tool Blanket 2023	$0	$0	$62,330	$0
HAR0	HAR0-H0-Tool Blanket 2024	$0	$0	$0	$64,199
HAR0	HAR0-H0-Tool Blanket 2025	$0	$0	$0	$0
HAR3	HAR3-H3 Inst Maint Switch on MV Bkrs	$75,000	$0	$0	$0
HAR3	HAR3-H3 Rpl #6 FWH Shell Exp Jnt	$90,000	$0	$0	$0
HAR3	HAR3-H3 Rpl Start up by Pass Vlv	$94,000	$0	$0	$0
HAR2	HAR2-H2 New Station Batteries	$0	$0	$96,350	$0
HAR3	HAR3-H3-New Station Batteries	$0	$0	$0	$106,058
HAR1	HAR1-H1 Instl Sootblwr Isolation Vlvs	$0	$110,000	$0	$0
HAR3	HAR3-H3 Instl Sootblwr Isolation Vlvs	$115,000	$0	$0	$0
HAR0	HAR0-H0 Rpl Main Electric Fire Pump	$0	$0	$130,347	$0
HAR2	HAR2-H2 Rpl MBFP dischrge Vlv Actuatr	$0	$0	$150,000	$0
HAR3	HAR3-H3- Rpl CT Acid Tank	$152,336	$0	$0	$0
HAR1	HAR1-H1-Rpl Station Batteries	$8,165	$157,583	$0	$0
HAR0	HAR0-H0 Rpl Diesel Fire Pump Engine	$0	$0	$0	$169,000
HAR1	HAR1-H1 Rpl Digital Valve Controllers	$0	$169,132	$0	$0

HAR3	HAR3-H3 Rpl Digital Valve Controllers	$0	$0	$0	$169,132
HAR2	HAR2-H2 Rpl Digital Valve Controllers	$0	$0	$172,664	$0
HAR3	HAR3-H3 Rpl Gen Hydrogen Purity Mntr	$175,500	$0	$0	$0
HAR1	HAR1-H1 Inst Maint Switch on MV Bkrs	$0	$180,000	$0	$0
HAR3	HAR3-H3-Rebag Partial 2021	$192,000	$0	$0	$0
HAR0	HAR0-H0-Inst. Air Monitoring Sys	$225,380	$400	$0	$0
HAR3	HAR3-H3 - Rpl Mud Drum orifices	$0	$0	$0	$254,250
HAR1	HAR1-H1 Generator Rewedge	$0	$293,947	$0	$0
HAR2	HAR2-H2 Rpl Gen Bkr FK05	$0	$0	$302,700	$0
HAR3	HAR3-H3 Rpl Gen Bkr FK65	$302,800	$0	$0	$0
HAR2	HAR2-H2 Inst Instrument Air Comp	$0	$0	$353,500	$0
HAR3	HAR3-H3 Inst Instrument Air Com	$0	$0	$353,500	$0
HAR0	HAR0-H0 Basement Winterization Ph 2	$354,938	$0	$0	$0
HAR0	HAR0-H0 Basement Winterization Ph 3	$0	$364,948	$0	$0
HAR1	HAR1-H1 Inst Liner in Circ Wtr Line	$0	$0	$0	$387,173
HAR3	HAR3-H3 Rpl Steam Cooled Spacer Tubes	$695,482	$0	$0	$0
HAR1	HAR1-H1 Rebuild Drag Chain CONV	$0	$703,637	$1,500	$0
HAR3	HAR3-H3 Rpl HPIP Turbine Blades	$722,500	$0	$0	$0
HAR2	HAR2-H2 Rpl Drag Chain CONV	$0	$0	$745,081	$1,500
HAR3	HAR3-Rpl U3 CT MCC s	$0	$0	$0	$61,488
HAR2	HAR2-Rpl U2 CT MCC s	$0	$0	$824,670	$0
HAR3	HAR3-H3 TCS Upgrade	$944,297	$0	$0	$0
HAR0	HAR0-H0-Rpl Resv Cool Wat Sys	$1,015,115	$0	$0	$0
HAR2	HAR2-H2-Rpl #2 HP FWH	$0	$133,000	$1,247,000	$0
HAR0	HAR0-H0 Emergent Bucket 2022	$0	$1,400,000	$0	$0
HAR3	HAR3-H3- Replace Radiant RH	$0	$0	$0	$4,000
HAR0	HAR0-H0- Emergent Bucket 2024	$0	$0	$0	$1,750,000
HAR0	HAR0-H0- Emergent Bucket 2025	$0	$0	$0	$0
HAR0	HAR0-H0- Emergent Bucket 2023	$0	$0	$1,900,000	$0
HAR0	HAR0-H0 Emergent Bucket 2021	$2,006,084	$0	$0	$0
HAR2	HAR2-H2 Generator Rotor Rewind	$0	$0	$2,354,222	$0
HAR3	HAR3-H3-Replace SH Division Panels	$0	$0	$0	$150,500
HAR3	HAR3-H3 Rpl Failed Circ liner	$3,033,677	$270,081	$0	$0
HAR3	HAR3-H3 - Rpl Cooling Tower Structure	$4,373,779	$0	$0	$0
HAR0_P	HAR0-HAR0C-NAAQS	$0	$0	$25,844,671	$33,374,274

Source: Strategic Asset Management

Harrington Units on Coal (Total O&M, exlcuding Labor Loadings)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Labor Expense	$ 8,687,026	$ 8,328,179	$ 8,394,623	$ 8,755,241	$ 9,580,488	$ 9,801,023	$ 10,144,552	$ 10,376,763	$ 10,485,101	$ 10,588,340	$ 10,549,119
Chemicals & Water	$ 1,734,016	$ 2,343,963	$ 2,574,885	$ 2,538,361	$ 2,077,716	$ 589,428	$ 850,578	$ 857,598	$ 940,169	$ 1,044,265	$ 1,050,666
Contract Labor & Consulting	$ 1,332,340	$ 2,787,735	$ 2,026,429	$ 3,200,079	$ 1,195,567	$ 907,369	$ 931,868	$ 957,029	$ 982,869	$ 1,009,406	$ 1,036,660
Materials	$ 3,216,166	$ 3,099,198	$ 2,893,264	$ 3,037,049	$ 3,048,197	$ 2,705,919	$ 2,761,931	$ 2,819,103	$ 2,877,459	$ 2,937,022	$ 2,997,819
Other (Contributions & Dues, Facility Cost, Misc. Other, Postage, Regulatory Fees, Rents, Transportation)	$ 1,769,995	$ 1,157,243	$ 1,162,278	$ 1,174,722	$ 1,174,722	$ 1,199,039	$ 1,223,859	$ 1,249,193	$ 1,275,051	$ 1,301,445	$ 1,328,385
Outage Expense	$ 2,355,000	$ 1,340,000	$ 2,195,000	$ 2,363,000	$ 2,795,000	$ 2,159,000	$ 536,000	$ 1,559,000	$ 536,000	$ 2,414,000	$ 536,000
Total Harrington Budget	**$ 19,094,544**	**$ 19,056,318**	**$ 19,246,480**	**$ 21,068,452**	**$ 19,871,691**	**$ 17,361,779**	**$ 16,448,789**	**$ 17,818,687**	**$ 17,096,649**	**$ 19,294,479**	**$ 17,498,649**
Variable O&M included above	$ 4,858,083	$ 6,511,470	$ 6,013,602	$ 6,991,179	$ 4,952,429	$ 3,002,961	$ 3,317,399	$ 3,379,239	$ 3,517,769	$ 3,679,061	$ 3,744,076
Total Harrington FOM exlcuding Labor Loadings	**$ 14,236,461**	**$ 12,544,849**	**$ 13,232,878**	**$ 14,077,273**	**$ 14,919,261**	**$ 14,358,818**	**$ 13,131,390**	**$ 14,439,448**	**$ 13,578,880**	**$ 15,615,418**	**$ 13,754,573**
Labor Base Costs Only (included in row 4)	$ 6,420,757	$ 6,275,340	$ 6,330,475	$ 6,623,883	$ 7,347,990	$ 7,520,345	$ 7,787,317	$ 7,968,874	$ 8,055,245	$ 8,137,706	$ 8,110,507
Labour Loadings (estimated at 52.42%)	$ 3,365,818	$ 3,289,589	$ 3,318,491	$ 3,472,298	$ 3,851,881	$ 3,942,232	$ 4,082,181	$ 4,177,354	$ 4,222,631	$ 4,265,857	$ 4,251,600
Total Harrington FOM including Labor Loadings	**$ 17,602,279**	**$ 15,834,437**	**$ 16,551,369**	**$ 17,549,571**	**$ 18,771,143**	**$ 18,301,049**	**$ 17,213,571**	**$ 18,616,802**	**$ 17,801,511**	**$ 19,881,275**	**$ 18,006,172**

	2020	2021	2022	2023	2024	2025	
Harrington Handling($000s)	13,710	13,710	13,710	13,710	13,710	13,710	2020 Savage Budget
Harrington Assessments($000s)	273	280	287	294	301	309	2019 Actual Tax Assessment; plus two stockpile surveys (Spring and Fall, ~$25k each)
Harrington Margin ($000s)	2,767	2,836	2,907	2,980	3,054	3,131	2019 Actuals; Escalated at 2.5% per year
Total	**16,750**	**16,826**	**16,904**	**16,984**	**17,065**	**17,149**	

Gas Conversion

Capital Expenditure

Capital Expenditure for New Gas Pipeline

		2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total
Unit 0	$ 64,214,669	$ 2,994,181	$ 10,184,890	$ 48,506,446	$ 2,529,152	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 64,214,669
Total	**$ 64,214,669**	**$ 2,994,181**	**$ 10,184,890**	**$ 48,506,446**	**$ 2,529,152**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 64,214,669**

On-going Capital Expenditure

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total
Unit 0	$ 1,825,862	$ 2,092,677	$ 1,983,199	$ 937,500	$ 956,250	$ 975,375	$ 994,883	$ 1,014,780	$ 1,035,076	$ 1,055,777	$ 1,076,893	$ 1,098,431	$ 1,120,399	$ 1,142,807	$ 1,165,663	$ 1,188,977	$ 909,567	$ 463,879	$ -	$ 21,037,995
Unit 1	$ 1,637,048	$ 62,500	$ 387,173	$ 937,500	$ 956,250	$ 975,375	$ 994,883	$ 1,014,780	$ 1,035,076	$ 1,055,777	$ 1,076,893	$ 1,098,431	$ 840,299	$ 428,553	$ -	$ -	$ -	$ -	$ -	$ 12,500,538
Unit 2	$ 133,000	$ 6,271,187	$ 1,500	$ 937,500	$ 956,250	$ 975,375	$ 994,883	$ 1,014,780	$ 1,035,076	$ 1,055,777	$ 1,076,893	$ 1,098,431	$ 1,120,399	$ 1,142,807	$ 874,248	$ 445,866	$ -	$ -	$ -	$ 19,133,972
Unit 3	$ 270,831	$ 353,500	$ 745,427	$ 937,500	$ 956,250	$ 975,375	$ 994,883	$ 1,014,780	$ 1,035,076	$ 1,055,777	$ 1,076,893	$ 1,098,431	$ 1,120,399	$ 1,142,807	$ 1,165,663	$ 1,188,977	$ 909,567	$ 463,879	$ -	$ 16,506,014
Total	**$ 3,866,741**	**$ 8,779,864**	**$ 3,117,299**	**$ 3,750,000**	**$ 3,825,000**	**$ 3,901,500**	**$ 3,979,530**	**$ 4,059,121**	**$ 4,140,303**	**$ 4,223,109**	**$ 4,307,571**	**$ 4,393,723**	**$ 4,201,497**	**$ 3,856,975**	**$ 3,205,574**	**$ 2,823,820**	**$ 1,819,134**	**$ 927,759**	**$ -**	**$ 69,178,519**

Fixed O&M

Fixed O&M

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total
Unit 1	$ 5,517,123	$ 5,849,857	$ 6,257,048	$ 6,100,350	$ 5,737,857	$ 6,205,601	$ 5,933,837	$ 6,627,092	$ 6,002,057	$ 6,120,431	$ 6,242,840	$ 6,367,697	$ 6,495,051	$ 6,624,952	$ 6,757,451	$ -	$ -	$ -	$ -	$ 92,839,242
Unit 2	$ 5,517,123	$ 5,849,857	$ 6,257,048	$ 6,100,350	$ 5,737,857	$ 6,205,601	$ 5,933,837	$ 6,627,092	$ 6,002,057	$ 6,120,431	$ 6,242,840	$ 6,367,697	$ 6,495,051	$ 6,624,952	$ 6,757,451	$ 8,195,577	$ 8,359,488	$ -	$ -	$ 109,394,307
Unit 3	$ 5,517,123	$ 5,849,857	$ 6,257,048	$ 6,100,350	$ 5,737,857	$ 6,205,601	$ 5,933,837	$ 6,627,092	$ 6,002,057	$ 6,120,431	$ 6,242,840	$ 6,367,697	$ 6,495,051	$ 6,624,952	$ 6,757,451	$ 8,195,577	$ 8,359,488	$ 13,539,894	$ 13,810,692	$ 136,744,894
Total	**$ 16,551,369**	**$ 17,549,571**	**$ 18,771,143**	**$ 18,301,049**	**$ 17,213,571**	**$ 18,616,802**	**$ 17,801,511**	**$ 19,881,275**	**$ 18,006,172**	**$ 18,361,294**	**$ 18,728,520**	**$ 19,103,090**	**$ 19,485,152**	**$ 19,874,855**	**$ 20,272,352**	**$ 16,391,153**	**$ 16,718,976**	**$ 13,539,894**	**$ 13,810,692**	**$ 338,978,442**

**Ended up using coal FOM 2022 - 2024*

Fuel Handling / Gas Demand

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total
Unit 1	$ 5,634,599	$ 5,661,197	$ 5,688,459	$ 2,100,000	$ 2,142,000	$ 2,184,840	$ 2,228,537	$ 2,273,108	$ 2,318,570	$ 2,364,941	$ 2,412,240	$ 2,460,485	$ 2,509,694	$ 2,559,888	$ 2,611,086	$ -	$ -	$ -	$ -	$ 45,149,643
Unit 2	$ 5,634,599	$ 5,661,197	$ 5,688,459	$ 2,100,000	$ 2,142,000	$ 2,184,840	$ 2,228,537	$ 2,273,108	$ 2,318,570	$ 2,364,941	$ 2,412,240	$ 2,460,485	$ 2,509,694	$ 2,559,888	$ 2,611,086	$ 2,663,308	$ 2,716,574	$ -	$ -	$ 50,529,525
Unit 3	$ 5,634,599	$ 5,661,197	$ 5,688,459	$ 2,100,000	$ 2,142,000	$ 2,184,840	$ 2,228,537	$ 2,273,108	$ 2,318,570	$ 2,364,941	$ 2,412,240	$ 2,460,485	$ 2,509,694	$ 2,559,888	$ 2,611,086	$ 2,663,308	$ 2,716,574	$ 2,770,905	$ 2,826,324	$ 56,126,754
Total	**$ 16,903,798**	**$ 16,983,591**	**$ 17,065,377**	**$ 6,300,000**	**$ 6,426,000**	**$ 6,554,520**	**$ 6,685,610**	**$ 6,819,323**	**$ 6,955,709**	**$ 7,094,823**	**$ 7,236,720**	**$ 7,381,454**	**$ 7,529,083**	**$ 7,679,665**	**$ 7,833,258**	**$ 5,326,616**	**$ 5,433,148**	**$ 2,770,905**	**$ 2,826,324**	**$ 151,805,923**

Pipeline O&M

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total
Unit 0	**$ -**	**$ -**	**$ -**	**$ 361,918**	**$ 369,156**	**$ 376,539**	**$ 384,070**	**$ 391,751**	**$ 399,586**	**$ 407,578**	**$ 415,730**	**$ 424,044**	**$ 432,525**	**$ 441,176**	**$ 449,999**	**$ 458,999**	**$ 468,179**	**$ 477,543**	**$ 487,094**	**$ 6,745,887**

Variable O&M

VO&M	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Unit 1	$ 1.21	$ 1.23	$ 1.26	$ 1.95	$ 1.99	$ 2.03	$ 2.07	$ 2.11	$ 2.15	$ 2.19	$ 2.24	$ 2.28	$ 2.33	$ 2.37	$ 2.42	$ 2.47	$ 2.52	$ 2.57	$ 2.62
Unit 2	$ 1.21	$ 1.23	$ 1.26	$ 1.95	$ 1.99	$ 2.03	$ 2.07	$ 2.11	$ 2.15	$ 2.19	$ 2.24	$ 2.28	$ 2.33	$ 2.37	$ 2.42	$ 2.47	$ 2.52		
Unit 3	$ 1.21	$ 1.23	$ 1.26	$ 1.95	$ 1.99	$ 2.03	$ 2.07	$ 2.11	$ 2.15	$ 2.19	$ 2.24	$ 2.28	$ 2.33	$ 2.37	$ 2.42	$ 2.47	$ 2.52	$ 2.57	$ 2.62

Unit Cost - Online	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Cost per hour (per unit)	$ 34.13	$ 34.81	$ 35.51	$ 108.46	$ 110.63	$ 112.85	$ 115.10	$ 117.41	$ 119.75	$ 122.15	$ 124.59	$ 127.08	$ 129.62	$ 132.22	$ 134.86	$ 137.56	$ 140.31	$ 143.12	$ 145.98
Commodity Charge	$ -	$ -	$ -	$ 0.0183	$ 0.0187	$ 0.0190	$ 0.0194	$ 0.0198	$ 0.0202	$ 0.0206	$ 0.0210	$ 0.0214	$ 0.0219	$ 0.0223	$ 0.0228	$ 0.0232	$ 0.0237	$ 0.0241	$ 0.0246

Source: SPS's 2021 - 2025 Capital Budget (ending 2024 after gas conversion)
Escalation 2%

		Budgeted							
Unit	Project Name	2021		2022		2023		2024	
HAR0	Annual Capital Expenditure	$	3,660,269	$	1,825,862	$	2,092,677	$	1,983,199
HAR1	Annual Capital Expenditure	$	42,415	$	1,637,048	$	62,500	$	387,173
HAR2	Annual Capital Expenditure	$	-	$	133,000	$	6,271,187	$	1,500
HAR3	Annual Capital Expenditure	$	11,133,637	$	270,831	$	353,500	$	745,427
	Total	**$**	**14,836,321**	**$**	**3,866,741**	**$**	**8,779,864**	**$**	**3,117,299**

Plant	Project Name	2021	2022	2023	2024
HAR3	HAR3-H3 Upgrd Cntrls Support Stations	$19,250	$750	$0	$0
HAR1	HAR1-H1 Upgrd Cntrls Support Stations	$2,250	$22,750	$0	$0
HAR2	HAR2-H2 Upgrade Support Stations	$0	$0	$25,000	$0
HAR1	HAR1-H1 Inst MBFP wtr in oil detction	$32,000	$0	$0	$0
HAR3	HAR3-H3 Inst MBFP wtr in oil detction	$32,600	$0	$0	$0
HAR3	HAR3-H3 Install XFMR DGA	$53,968	$0	$0	$0
HAR0	HAR0-H0-Tool Blanket 2021	$58,752	$0	$0	$0
HAR0	HAR0-H0-Tool Blanket 2022	$0	$60,514	$0	$0
HAR1	HAR1-H1 Inst DGA	$0	$0	$61,000	$0
HAR3	HAR3-H3-Rpl Inst Air Dryer	$61,448	$0	$0	$0
HAR0	HAR0-H0-Tool Blanket 2023	$0	$0	$62,330	$0
HAR0	HAR0-H0-Tool Blanket 2024	$0	$0	$0	$64,199
HAR0	HAR0-H0-Tool Blanket 2025	$0	$0	$0	$0
HAR3	HAR3-H3 Inst Maint Switch on MV Bkrs	$75,000	$0	$0	$0
HAR3	HAR3-H3 Rpl #6 FWH Shell Exp Jnt	$90,000	$0	$0	$0
HAR3	HAR3-H3 Rpl Start up by Pass Vlv	$94,000	$0	$0	$0
HAR2	HAR2-H2 New Station Batteries	$0	$0	$96,350	$0
HAR3	HAR3-H3-New Station Batteries	$0	$0	$0	$106,058
HAR1	HAR1-H1 Instl Sootblwr Isolation Vlvs	$0	$110,000	$0	$0
HAR3	HAR3-H3 Instl Sootblwr Isolation Vlvs	$115,000	$0	$0	$0
HAR0	HAR0-H0 Rpl Main Electric Fire Pump	$0	$0	$130,347	$0
HAR2	HAR2-H2 Rpl MBFP dischrge Vlv Actuatr	$0	$0	$150,000	$0
HAR3	HAR3-H3- Rpl CT Acid Tank	$152,336	$0	$0	$0
HAR1	HAR1-H1-Rpl Station Batteries	$8,165	$157,583	$0	$0
HAR0	HAR0-H0 Rpl Diesel Fire Pump Engine	$0	$0	$0	$169,000
HAR1	HAR1-H1 Rpl Digital Valve Controllers	$0	$169,132	$0	$0

HAR3	HAR3-H3 Rpl Digital Valve Controllers	$0	$0	$0	$169,132	
HAR2	HAR2-H2 Rpl Digital Valve Controllers	$0	$0	$172,664	$0	
HAR3	HAR3-H3 Rpl Gen Hydrogen Purity Mntr	$175,500	$0	$0	$0	
HAR1	HAR1-H1 Inst Maint Switch on MV Bkrs	$0	$180,000	$0	$0	
HAR3	HAR3-H3-Rebag Partial 2021	$192,000	$0	$0	$0	
HAR0	HAR0-H0-Inst. Air Monitoring Sys	$225,380	$400	$0	$0	
HAR3	HAR3-H3 - Rpl Mud Drum orifices	$0	$0	$0	$254,250	
HAR1	HAR1-H1 Generator Rewedge	$0	$293,947	$0	$0	
HAR2	HAR2-H2 Rpl Gen Bkr FK05	$0	$0	$302,700	$0	
HAR3	HAR3-H3 Rpl Gen Bkr FK65	$302,800	$0	$0	$0	
HAR2	HAR2-H2 Inst Instrument Air Comp	$0	$0	$353,500	$0	
HAR3	HAR3-H3 Inst Instrument Air Com	$0	$0	$353,500	$0	
HAR0	HAR0-H0 Basement Winterization Ph 2	$354,938	$0	$0	$0	
HAR0	HAR0-H0 Basement Winterization Ph 3	$0	$364,948	$0	$0	
HAR1	HAR1-H1 Inst Liner in Circ Wtr Line	$0	$0	$0	$387,173	
HAR3	HAR3-H3 Rpl Steam Cooled Spacer Tubes	$695,482	$0	$0	$0	
HAR1	HAR1-H1 Rebuild Drag Chain CONV	$0	$703,637	$1,500	$0	
HAR3	HAR3-H3 Rpl HPIP Turbine Blades	$722,500	$0	$0	$0	
HAR2	HAR2-H2 Rpl Drag Chain CONV	$0	$0	$745,081	$1,500	
HAR3	HAR3-Rpl U3 CT MCC s	$0	$0	$0	$61,488	
HAR2	HAR2-Rpl U2 CT MCC s	$0	$0	$824,670	$0	
HAR3	HAR3-H3 TCS Upgrade	$944,297	$0	$0	$0	
HAR0	HAR0-H0-Rpl Resv Cool Wat Sys	$1,015,115	$0	$0	$0	
HAR2	HAR2-H2-Rpl #2 HP FWH	$0	$133,000	$1,247,000	$0	
HAR0	HAR0-H0 Emergent Bucket 2022	$0	$1,400,000	$0	$0	
HAR3	HAR3-H3- Replace Radiant RH	$0	$0	$0	$4,000	
HAR0	HAR0-H0- Emergent Bucket 2024	$0	$0	$0	$1,750,000	
HAR0	HAR0-H0- Emergent Bucket 2025	$0	$0	$0	$0	
HAR0	HAR0-H0- Emergent Bucket 2023	$0	$0	$1,900,000	$0	
HAR0	HAR0-H0 Emergent Bucket 2021	$2,006,084	$0	$0	$0	
HAR2	HAR2-H2 Generator Rotor Rewind	$0	$0	$2,354,222	$0	
HAR3	HAR3-H3-Replace SH Division Panels	$0	$0	$0	$150,500	
HAR3	HAR3-H3 Rpl Failed Circ liner	$3,033,677	$270,081	$0	$0	
HAR3	HAR3-H3 - Rpl Cooling Tower Structure	$4,373,779	$0	$0	$0	
HAR0_P	HAR0-HAR0C-NAAQS	$0	$2,994,181	$10,184,890	$48,506,446	$2,529,152

Source: Strategic Asset Management

Harrington Units on Coal (Total O&M, exlcuding Labor Loadings)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Labor Expense	$ 8,687,026	$ 8,328,179	$ 8,394,623	$ 8,755,241	$ 9,580,488	$ 9,801,023	$ 10,144,552	$ 10,376,763	$ 10,485,101	$ 10,588,340	$ 10,549,119
Chemicals & Water	$ 1,734,016	$ 2,343,963	$ 2,574,885	$ 2,538,361	$ 2,077,716	$ 589,428	$ 850,578	$ 857,598	$ 940,169	$ 1,044,265	$ 1,050,666
Contract Labor & Consulting	$ 1,332,340	$ 2,787,735	$ 2,026,429	$ 3,200,079	$ 1,195,567	$ 907,369	$ 931,868	$ 957,029	$ 982,869	$ 1,009,406	$ 1,036,660
Materials	$ 3,216,166	$ 3,099,198	$ 2,893,264	$ 3,037,049	$ 3,048,197	$ 2,705,919	$ 2,761,931	$ 2,819,103	$ 2,877,459	$ 2,937,022	$ 2,997,819
Other (Contributions & Dues, Facility Cost, Misc. Other, Postage, Regulatory Fees, Rents, Transportation)	$ 1,769,995	$ 1,157,243	$ 1,162,278	$ 1,174,722	$ 1,174,722	$ 1,199,039	$ 1,223,859	$ 1,249,193	$ 1,275,051	$ 1,301,445	$ 1,328,385
Outage Expense	$ 2,355,000	$ 1,340,000	$ 2,195,000	$ 2,363,000	$ 2,795,000	$ 2,159,000	$ 536,000	$ 1,559,000	$ 536,000	$ 2,414,000	$ 536,000
Total Harrington Budget	**$ 19,094,544**	**$ 19,056,318**	**$ 19,246,480**	**$ 21,068,452**	**$ 19,871,691**	**$ 17,361,779**	**$ 16,448,789**	**$ 17,818,687**	**$ 17,096,649**	**$ 19,294,479**	**$ 17,498,649**
Variable O&M included above	$ 4,858,083	$ 6,511,470	$ 6,013,602	$ 6,991,179	$ 4,952,429	$ 3,002,961	$ 3,317,399	$ 3,379,239	$ 3,517,769	$ 3,679,061	$ 3,744,076
Total Harrington FOM exlcuding Labor Loadings	**$ 14,236,461**	**$ 12,544,849**	**$ 13,232,878**	**$ 14,077,273**	**$ 14,919,261**	**$ 14,358,818**	**$ 13,131,390**	**$ 14,439,448**	**$ 13,578,880**	**$ 15,615,418**	**$ 13,754,573**
Labor Base Costs Only (included in row 4)	$ 6,420,757	$ 6,275,340	$ 6,330,475	$ 6,623,883	$ 7,347,990	$ 7,520,345	$ 7,787,317	$ 7,968,874	$ 8,055,245	$ 8,137,706	$ 8,110,507
Labour Loadings (estimated at 52.42%)	$ 3,365,818	$ 3,289,589	$ 3,318,491	$ 3,472,298	$ 3,851,881	$ 3,942,232	$ 4,082,181	$ 4,177,354	$ 4,222,631	$ 4,265,857	$ 4,251,600
Total Harrington FOM including Labor Loadings	**$ 17,602,279**	**$ 15,834,437**	**$ 16,551,369**	**$ 17,549,571**	**$ 18,771,143**	**$ 18,301,049**	**$ 17,213,571**	**$ 18,616,802**	**$ 17,801,511**	**$ 19,881,275**	**$ 18,006,172**

	2020	2021	2022	2023	2024	2025	
Harrington Handling($000s)	13,710	13,710	13,710	13,710	13,710	13,710	2020 Savage Budget
Harrington Assessments($000s)	273	280	287	294	301	309	2019 Actual Tax Assessment; plus two stockpile surveys (Spring and Fall, ~$25k each
Harrington Margin ($000s)	2,767	2,836	2,907	2,980	3,054	3,131	2019 Actuals; Escalated at 2.5% per year
Total	**16,750**	**16,826**	**16,904**	**16,984**	**17,065**	**17,149**	

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QUESTION NO. Sierra Club 2-3:

Refer to SPS response to Sierra Club 1-4(e) and (h) regarding FOM and capital cost forecasts.

a. Explain the basis of the Company's assumptions and adjustments for FOM and capital costs across all scenarios. Provide all documentation and analysis that shows the basis of each cost forecast, and how each was developed.

b. Explain how both the FOM and capital expenditure costs were adjusted down in the scenarios where one or two units were retired. Provide all analysis that shows how SPS calculated the adjustments to the values it used in EnCompass.

c. State whether the Company assumed that capital costs and FOM costs ramped down in advance of a unit's retirement.

    i. If yes, explain the assumptions and provide all workbooks that show the Company's assumptions.

    ii. If no, explain what the values were not ramped down in advance of retirement.

RESPONSE:

a. Assumptions and Adjustments

On-going Capital Expenditure Forecasts

For scenarios in which coal operations are maintained beyond 2024 (i.e. the SDA and DSI environmental control scenarios), SPS relied upon its final five-year capital expenditure budget (2020 – 2024) to assume continued coal operations. The five year average capital expenditure was then used all for future years and escalated at 2% per year. SPS then incorporated additional capital expenditure for the SDA and DSI environmental controls systems based on the Burns and McDonnell study.

For scenarios in which coal operation are ceased at the end of 2024 (i.e. the gas conversion and early retirement scenarios), SPS relied upon its 2021 – 2025 capital budget for the years 2021 – 2024. Based on discussions with the Xcel Energy Projects team, SPS then assumed an annual capital expenditure forecast of $3.75M per year (escalated at 2% per year) after the units were converted to operate on natural gas.

In all scenarios, SPS assumed no capital expenditure in the final year of each Harrington unit's operation, a 50% reduction in the year prior to the unit's retirement and 25% reduction two years prior to the unit's retirement.

Supporting documentation is contained on the worksheets entitled "GasCapX" or "CoalCapX" in each of the spreadsheets provided in response to Exhibit SPS-SC 1-4(e)(i).

Fixed O&M

For each scenario, SPS relied upon fixed O&M budgets created by Xcel Energy's Strategic Asset Management group which are contained on the tabs titled "FOM" in each of the spreadsheets provided in response to Exhibit SPS-SC 1-4(e)(i). The total plant level fixed O&M is then divided equally among each unit.

b. In the event one or two units are retired at the end of 2024, SPS removed the capital expenditure and fixed O&M costs for each of the retiring units after the unit was retired (i.e., 2025 and beyond). In addition, as described in subpart (a), SPS assumed no capital expenditure in the final year of each Harrington unit's operation, a 50% reduction in the year prior to the unit's retirement and 25% reduction two years prior to the unit's retirement. No further adjustments were made to FOM in the years preceding a unit's retirement.

c. Yes. Please refer SPS's response to subpart (b).

Preparer: Ben R. Elsey
Sponsor: Ben R. Elsey

RESPONSES

QUESTION NO. Sierra Club 3-1:

State whether SPS evaluated the early retirement of Harrington, assuming that any remaining plant balance was depreciated over each unit' s current lifetime.

a. If yes, provide all such analysis.

b. If no, explain why no such analysis has been completed.

RESPONSE:

No.

a. Not applicable.

b. No, no such analysis was completed. First, such an analysis would not resolve the challenges SPS face if the Harrington Units are retired by the end of 2024. Second, such an analysis would require SPS customers to continue to incur depreciation expense for the Harrington Units up to 16 years after they are used and useful. Please refer to pages 8-9 of the Direct Testimony of Ben R. Elsey for additional information.

Preparer: Ben R. Elsey
Sponsors: Ben R. Elsey, William A. Grant

QUESTION NO. Sierra Club 3-2:

State whether SPS has evaluated the possibility of converting the undepreciated plant balance at Harrington into a regulatory asset and depreciating the balance over the current plant life if any of the units, or the entire plant, retires early.

a. If yes, provide all analysis and reports evaluating this option.
b. If no, explain why not

RESPONSE:

No.

a. Not applicable.

b. Please refer to SPS's response to Question No. SC 3-1.

Preparer: Ben R. Elsey
Sponsors: Ben R. Elsey, William A. Grant

QUESTION NO. Sierra Club 3-4

State whether SPS tested a CO2 price as part of the Harrington analysis.

a. If yes, provide all analysis.
b. If no, explain why not.

RESPONSE:

No.

a. Not applicable.

b. SPS did not evaluate a speculative carbon pricing as part of the Harrington analysis as no such policy or regulation exists today or has even been proposed in an actionable forum.

Preparers: Ben R. Elsey, Jeffrey L. West
Sponsors: Ben R. Elsey, Jeffrey L. West

QUESTION NO. Sierra Club 3-6:

Refer to the EnCompass files provided for the Harrington 2021 analysis.

a. Explain what costs are represented in the Annual Capital Expenditures ($000) timeseries.
b. Explain what costs are represented in the Capital Expenditures ($000) field.
c. Explain why Scenario 5 (where units 1 and 2 retire early) uses the same FOM cost stream for Units 1 and 2 as Scenario 2 (where both units convert to gas), instead of the same cost stream as Scenario 1 (where all units retire early).
d. Explain why Scenario 6 (where unit 1 retires early) uses the same FOM cost stream for unit 1 as Scenario 2 (where unit 1 converts to gas) instead of the same cost stream as Scenario 1 (where the unit retires early).

RESPONSE:

a. SPS confirmed with Sierra Club this question is regarding the 'TimeSeriesDatedChanges' tab in the file 'SPS_ReferenceCase_1H21_2021-06-21.xlsx'.

   The annual capital expenditures ($,000) timeseries represents on-going capital expenditure forecasts for each unit. For example, the 'Early Retire 2024 Annual CapEx' time series includes on-going capital expenditure projections for Harrington units 0 – 3 assuming all three Harrington units retire end of year 2024. The 'Gas 20***xx*** Annual CapX' times series includes on-going capital expenditure projections for Harrington units 0 – 3 assuming all three units are converted to operate on natural gas and retire at the end of their currently scheduled service lives'.

   *Note: In the second example above, the naming structure for the times series is specific to the unit's retirement date. For example, the time series for Unit 1 is called "Gas 2036 Annual CapEx", the time series for Unit 2 is called "Gas 2038 Annual CapEx" etc.

b. SPS confirmed with Sierra Club this question is regarding the 'Project' tab in the file 'SPS_ReferenceCase_1H21_2021-06-21.xlsx'.

   The column 'CapEx' generally represents the existing net book value plus decommissioning costs for each unit. In the case of the Harrington Units there are multiple entries depending on the fuel source and retirement date of the Harrington Units and additional entries for the SDA and DSI environmental control options. For example, the entry 'Harrington 1 - Coal 2036 CapEx' represents continued coal operation and depreciating the net book value through 2036. The entries 'Harrington 1 - Coal 2024 CapEx' and 'Harrington 1 - Gas 2036 CapEx' represent (1) converting the units to operate on natural gas, (2) depreciating the coal assets through 2024, and

(3) depreciating the remaining assets through 2036.

c. As demonstrated in Exhibit SPS-SC 1-4(e)(i), for the years 2022 – 2024, SPS had originally intended to utilize a slightly lower fixed O&M forecast when comparing the cessation of coal scenarios against the continued coal operation scenarios. In other words, (1) retirement of all three units, (2) conversion of all three units, or any (3) combination of retirement and gas conversion would use a slightly lower O&M forecast in 2022 – 2024 when compared to either of the environmental control scenarios. However, upon discovering such a minor change was immaterial, SPS opted against adding another layer of complexity to the analysis and kept the fixed O&M forecast in 2022 – 2024 consistent across all scenarios, with the exception of retiring all three units. In doing so, the analysis understates the advantages of converting Harrington to gas compared against alternatives such as continued operation of coal and early retirement of the units.

d. Please refer to subpart (c).

Preparer: Ben R. Elsey
Sponsor: Ben R. Elsey

QUESTION NO. Sierra Club 3-7:

Please refer to SPS's modeling files provided in response to SC 1-3(i). Please provide SPS's projected emission rates for the following pollutants at the Harrington units if converted to operate on gas:

a. CO_2,
b. NO_x,
c. particulate matter.
d. Explain in detail and provide all documentation supporting SPS's assumptions around the projected emissions rates for CO_2, NO_x, and particulate matter, if the Harrington units are converted to gas.

RESPONSE:

a. Please refer to the Resource Annual Emissions tab in the EnCompass Output Files provided in Exhibit SPS-SC 1-3(i)(CONF).

b. Please refer to subpart (a).

c. Please refer to subpart (a).

d. For the purposes of modeling the Harrington units following the gas conversion, SPS relied upon the emission rates of its most similar gas-steam unit, Jones 2. These will be refined as performance specifications for the modified equipment once they are obtained and verified.

Preparers: Jeffrey L. West, Ben R. Elsey
Sponsors: Ben R. Elsey, Jeffrey L. West

QUESTION NO. Sierra Club 3-11:

Please refer to SPS Exhibit SPS-SC 1-27.1 at 4 of 90.

a. Did SPS obtain any authorization from the U.S. Army Corps of Engineers for the proposed pipeline, including, but not limited to, any certification under Nationwide Permit 12 or any other authorization under the Clean Water Act or the Endangered Species Act? If so, please provide all such authorizations or documents reflecting any communications with the U.S. Army Corps of Engineers related to any such authorization. If not, why not?

b. Please provide all communications with the U.S. Army Corps of Engineers related to the need for any authorization for the pipeline.

RESPONSE:

To date, there has been no correspondence with the U.S. Army Corp or Engineers regarding the proposed pipeline. This agency will be contacted in the future as required.

Preparer: Jeffrey L. West
Sponsor: Jeffrey L. West

QUESTION NO. Sierra Club 3-12:

Please refer to SPS Exhibit SPS-SC 1-27.1 at 17 of 90.

a. Did SPS obtain any authorization from the Fish and Wildlife Service under the Endangered Species Act for the proposed pipeline? If so, please provide all such authorizations or documents reflecting any communications related to any such authorization. If not, why not?

b. Please provide all communications with the Texas Parks & Wildlife Department related to the pipeline or its impacts to endangered species, including, but not limited to all assessments referenced in paragraph 12.3.

c. Please provide all communications with the Fish and Wildlife Service related to the pipeline or its impacts to endangered species, including, but not limited to all assessments, all additional species-specific surveys, or seasonal restrictions referenced in paragraph 12.3.1

RESPONSE:

a. There has been no correspondence with Fish and Wildlife Service to date. This agency will be contacted in the future as required.

b. In Texas, the Texas Parks & Wildlife Department requested that SPS provide a copy of the Environmental Assessment filed in the Texas case (Docket No. 52485). Please refer to Exhibit SPS-SC 4-13 for a copy of the communication.

c. See "a" above.

Preparer: Jeffrey L. West
Sponsor: Jeffrey L. West

QUESTION NO. Sierra Club 3-13:

Please refer to SPS Exhibit SPS-SC 1-27.1 at 18 of 90. Did SPS obtain any authorization from the U.S. Environmental Protection Agency or the Texas Commission on Environmental Quality for the proposed pipeline, including, but not limited to any authorization under the Clean Water Act or the Clean Air Act? If so, please provide all such authorizations or documents reflecting any communications related to any such authorization. If not, why not?

RESPONSE:

To date, there has been no communication with the US Environmental Protection Agency or the Texas Commission on Environmental Quality regarding the proposed pipeline.

This agency will be contacted in the future as required.

Preparer: Jeffrey L. West
Sponsor: Jeffrey L. West

QUESTION NO. Sierra Club 3-14:

Please provide all communications with the U.S. Environmental Protection Agency or the Texas Commission on Environmental Quality related to the pipeline, including, but not limited to all assessments referenced in paragraph 12.5.

RESPONSE:

There has been no communication with the US Environmental Protection Agency or the Texas Commission on Environmental Quality to date regarding the proposed pipeline. These agencies will be contacted in the future as required.

Preparer: Jeffrey L. West
Sponsor: Jeffrey L. West

QUESTION NO. Sierra Club 5-3:

Refer to the Direct Testimony of Ben Elsey at page 19, lines 7-19.

a. Confirm that SPS President David Hudson is on the SPP Board of Directors/Members Committee, if not, please explain whether the Company has a representative on the SPP Board of Directors, and identify that representative.
b. Confirm that SPS has representatives on SPP's Transmission Working Group, and please identify the number of representatives the Company has on the Working Group.
c. Has SPS proposed any plans or raised concerns to SPP regarding the "backlog in processing and studying new generator applications"? If so, please provide any such plans. If not, why not?
d. To the extent not provided in response to Question 5.3.c immediately above, provide all communications, presentations, reports, studies, and/or proposals from SPS concerning the "backlog in processing and studying new generator applications."

RESPONSE:

a. Denied. David Hudson has not served on the Southwest Power Pool Board of Directors, he has served on the Southwest Power Pool Members Committee. David Hudson has also announced his retirement. His seat on the Southwest Power Pool Members Committee will be filled through a process led by Southwest Power Pool. SPS has no representative on the Southwest Power Pool Board of Directors. The Southwest Power Pool Members Committee has over 30 members, is advisory in nature, and has no official vote on Southwest Power Pool matters.
b. Confirmed. SPS has one representative from Xcel Energy that is a member of the Southwest Power Pool's Transmission Working Group. There are 27 members on Southwest Power Pool's Transmission Working Group and SPS has one member in the group.
c. Yes. SPS representatives have been actively engaged in the Southwest Power Pool stakeholder process and have raised concerns about the backlog in studying new generator applications.
d. SPS is not in possession of any material responsive to this request. The Southwest Power Pool website may contain material that is responsive to this request on specific committee meeting minutes web pages.

Preparer: William A. Grant
Sponsor: William A. Grant

Exhibit DG-3

BEFORE THE
NEW MEXICO PUBLIC REGULATION COMMISSION

IN THE MATTER OF SOUTHWESTERN PUBLIC SERVICE COMPANY'S APPLICATION FOR: (1) REVISION OF ITS RETAIL RATES UNDER ADVICE NOTICE NO. 282; (2) AUTHORIZATION AND APPROVAL TO SHORTEN THE SERVICE LIFE AND ABANDON ITS TOLK GENERATING STATION UNITS AND (3) OTHER RELATED RELIEF	CASE NO. 19-00170-UT

PUBLIC (REDACTED) VERSION

Direct Testimony of Devi Glick

On Behalf of

Sierra Club

November 22, 2019

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1. INTRODUCTION AND PURPOSE OF TESTIMONY

Q Please state your name and occupation.

A My name is Devi Glick. I am a Senior Associate at Synapse Energy Economics, Inc. My business address is 485 Massachusetts Avenue, Suite 2, Cambridge, Massachusetts 02139.

Q Please describe Synapse Energy Economics.

A Synapse is a research and consulting firm specializing in energy and environmental issues, including electric generation, transmission and distribution system reliability, ratemaking and rate design, electric industry restructuring and market power, electricity market prices, stranded costs, efficiency, renewable energy, environmental quality, and nuclear power.

Synapse's clients include state consumer advocates, public utilities commission staff, attorneys general, environmental organizations, federal government agencies, and utilities.

Q Please summarize your work experience and educational background.

A At Synapse, I conduct economic analysis and write testimony and publications that focus on a variety of issues related to electric utilities. These issues include, non-exhaustively, power plant economics, utility resource planning practices, valuation of distributed energy resources, and utility handling of coal combustion residuals waste. I have submitted expert testimony on plant economics, utility resource needs, and solar valuation in the states of Connecticut, Virginia, North Carolina, South Carolina, and Florida. I authored a report on replacement analysis for the San Juan Generating Station in northwestern New Mexico. In the course of my work, I develop in-house models and perform analysis using industry-standard models.

Prior to joining Synapse, I worked at Rocky Mountain Institute, focusing on a wide range of energy and electricity issues. I have a master's degree in public policy and a master's degree in environmental science from the University of Michigan, as well as a bachelor's degree in environmental studies from Middlebury College. I have more than seven years of professional experience as a consultant, researcher, and analyst. A copy of my current resume is attached as Exhibit DG-1.

Q On whose behalf are you testifying in this case?

A I am testifying on behalf of Sierra Club.

Q Have you testified previously before the New Mexico Public Regulation Commission?

A No, I have not.

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

A My testimony evaluates Southwestern Service Company's ("SPS" or the "Company") Application as it relates to the Company's request for cost recovery in base rates for its operations and investment at its Tolk Generating Station ("Tolk") and its Harrington Generating Station ("Harrington"), both multi-unit coal-fired power plants.

First, in Section 3 below, I evaluate Tolk and Harrington's actual historical economic performance over the past few years. My analysis looks first at the plants' overall economics relative to the market, and then more narrowly on an operational basis, by calculating each plant's annual costs and revenues from 2015 through 2018. In doing so, I evaluate the reasonableness of SPS's request to recover ongoing operations and maintenance ("O&M") and capital expenditures—including certain avoidable costs that stem from the Company's general practice of choosing to "self-commit" the units, *i.e.*, dispatching the units into the market regardless of whether it loses money by doing so.

Next, in Sections 4–6, I evaluate the likely future economic performance of the Tolk and Harrington plants. For the Tolk plant specifically, I focus on the reasonableness of SPS's request for approval to operate both of Tolk's two units seasonally, and in synchronous condenser mode, in an attempt to address the plant's serious water constraints.

Finally, in Section 7, I discuss the problems with SPS's prior Strategist unit retirement analysis. I also describe my recommendations that SPS should perform updated, more comprehensive (and hence more accurate) retirement analysis for both Tolk and Harrington.

Q What documents do you rely upon for your analysis, findings, and observations?

A My analysis relies primarily upon the workpapers, exhibits, and discovery responses of SPS witnesses associated with this proceeding. Additionally, I rely to a limited extent on certain external, publicly available documents such as the Southwest Power Pool's ("SPP") 2018 State of the Market Report and U.S. Energy Information Administration (EIA) data.

2. FINDINGS AND RECOMMENDATIONS

Q Please summarize your findings.

A My primary findings include the following:

1. Tolk has historically been operated and dispatched uneconomically. When it converts to seasonal operation, it will likely continue to operate uneconomically, at an unnecessary cost to ratepayers.

2. Harrington, too, has historically been operating uneconomically and will likely continue to do so.

3. SPS's general practice of deciding to "self-commit" these units in the SPP market—so that they are dispatched even when wholesale prices are lower than what's needed for the units to break even—has resulted in net uneconomic operations at both Tolk and Harrington at ratepayers' expense.

4. SPS cannot economically procure enough water to operate through the Tolk units' current respective retirement dates of 2042 and 2045.

5. Even if SPS can procure enough water to operate Tolk seasonally, or at a reduced capacity through 2031, the Company has not demonstrated that doing so would be the least-cost option to provide its customers with reliable service.

6. SPS's future operating plan and economic analysis for Tolk does not consider: (1) the risk that the water shortage faced by the plant is more extreme than currently projected, (2) the potential opportunity to sell the water for valuable alternative uses, (3) the impact of water limitations on peak availability, and (4) the possibility of retiring the generating assets at Tolk while operating the synchronous condenser year-round to get the necessary voltage support services.

7. SPS's 2014–2015 unit replacement analysis for Tolk and Harrington relies on outdated demand forecasts and resource cost assumptions. In addition, SPS's analysis fails to consider future capital expenditures that may be necessary to

address both current and reasonably possible future environmental regulations.

Q Please summarize your recommendations.

Based on my findings, I offer the following chief recommendations:

1. The Commission should disallow recovery of the increment of test year (April 1, 2018–March 31, 2019) O&M expenses at Tolk and Harrington incurred during the months of the year that the Company's self-dispatch practices for each plant resulted in net uneconomic operations. During those months, the Commission could disallow specifically the increment of cost incurred to operate and dispatch the units that is over and above the cost at which SPS could have procured energy from the SPP market to serve its customers. To the extent SPS has not provided data at a sufficiently granular level to enable calculation, the Commission should order SPS to provide it.
2. The Commission should investigate (as some other regulators have) whether costs (including fuel costs) have been improperly passed on to customers due to uneconomic self-commitment and dispatch of Tolk and Harrington.
3. The Commission should deny recovery of the costs of any significant future capital projects that may be intended to prolong the lives of Tolk and Harrington as generating assets, given the plants' uneconomic performance and the impending water shortages at Tolk.
4. The Commission should require SPS to perform a full retirement analysis for Tolk, assuming a retirement date earlier than 2025 as part of its next Integrated Resource Plan ("IRP"). This analysis should include sensitivities on the timing of water depletion and incorporate (1) the risk of significant future capital and O&M expenditures on environmental compliance, (2) potential revenue from sale of the

water, and (3) unit de-rating to reflect the risk to peak operations as the aquifer becomes depleted.

5. The Commission should require SPS to perform and submit an updated unit replacement study for Harrington as part of its next IRP. This analysis should include the risk of substantial future expenditures (capital as well as any increased O&M) stemming from environmental compliance, as well as the possibility of seasonal operations.

3. SPS HAS BEEN OPERATING ITS COAL PLANTS UNECONOMICALLY SINCE AT LEAST 2015

Q Please summarize this section.

A I start by providing a brief overview of the Tolk and Harrington plants. I then summarize SPS's rate requests regarding historical capital and O&M costs. In Section (i), I evaluate the economics of Tolk and Harrington, and I find that total costs exceeded the cost to procure energy from the market in each year from 2015 through 2018 for both plants. In Section (ii), I evaluate the annual operational performance of Tolk and Harrington from 2015 through 2018. I find that variable operational costs alone often exceeded the cost at which SPS could have procured energy from the SPP market, which could have provided retail customers with less costly (while adequate and reliable) service. In Section (iii), I review SPS's coal plant dispatch practices more broadly, discuss the implications for ratepayers, and recommend that the Commission disallow an increment of test year (April 1, 2018–March 31, 2019) O&M expenses at Tolk and Harrington on the basis of uneconomic operations stemming from self-commitment in the SPP market.

Q Please provide a brief overview of the Tolk Generating Station.

A Tolk consists of two 1980s-era coal-fired units located in Sudan, Texas. Unit 1 is rated at 540 MW and Unit 2 is rated at 542 MW. Although the units were originally estimated to operate for only 35 years—*i.e.*, until 2017 (Unit 1) and 2020 (Unit 2)—the Commission approved extensions of their retirement dates to 2042 and 2045, respectively.[1] Tolk relies exclusively on groundwater from the Ogallala Aquifer for generation cooling. However, as SPS's own testimony in this case emphasizes, the aquifer is currently in serious and irreversible decline.[2] At the current rate of consumption, SPS will not have sufficient water to operate the plant beyond the mid-2020s at the latest.[3]

Q Please provide a brief overview of the Harrington Generating Station.

A Harrington consists of three coal-fired units located northeast of Amarillo, Texas. The plant's units came online between 1976 and 1989. Units 1 and 2 are rated at 339 MW, and Unit 3 is rated at 340 MW. The units currently have Commission-approved retirement dates of 2036, 2038, and 2040, respectively.

Q What are SPS's requests in this rate case for Tolk and Harrington?

A SPS is requesting the following:

1. Inclusion in base rates of O&M costs for the test year period April 1, 2018–March 31, 2019 for the operation of Tolk and Harrington;

[1] Direct Testimony of M. Lytal on Behalf of SPS, at 51–52.

[2] *Id.* at 53.

[3] *Id.* at 56.

2. Inclusion in rate base of capital expenditures of $4.3 million for Tolk and $3.9 million for Harrington for the test year period of April 1, 2018–March 31, 2019,[4] as well as $1.87 million for Tolk and $3.0 million for Harrington for the period April 1, 2019–August 31, 2019[5] (associated depreciation expenses and a return on investment requested for inclusion as well);
3. A change to Tolk's retirement dates from 2042 for Unit 1 and 2045 for Unit 2, to 2032 for both units, along with a corresponding adjustment of depreciation rates; and
4. A switch to the seasonal operation of both units starting in 2020.[6]

i. Tolk and Harrington each lost money overall relative to the market from 2015 through 2018

Q What did you find regarding the overall economic performance of the Tolk units?

A Using data provided by SPS, I calculated that the Tolk units incurred net losses relative to the SPP energy market in the years 2015 through 2018. This is based on a comparison of the annual costs of energy production and the annual market revenue for each of the two Tolk units. Table 1 shows that the Tolk units collectively lost at least $34 million relative to the market in each year from 2015 through 2018. This includes annual losses relative to the market as high as $33

[4] *Id.* at Exhibit ML-2, New Mexico Retail portion of Additions to Plant-in-service.

[5] *Id.*

[6] *E.g.*, Direct Testimony of W. Grant on Behalf of SPS at 8.

million for Tolk Unit 1 alone in 2015. Over the four-year timeframe, the Tolk units combined lost $158 million relative to the market.

Table 1. Net annual revenues of Tolk 1 and 2, 2015-2018 (2018 $Million)

Unit	2015	2016	2017	2018	Total
Tolk 1					
Tolk 2					
Total					

Source: Workpaper of B. Weeks, SO - _SPS_SCENARIO2_REDUXOPS_2031.xlsx, Exhibit SPS-SC 1-9(k) and Response to SPS-SC 1-9(p), Exhibit SPS-SC 1-9(f) and Exhibit SPS-SC 1-9(i).

Q What did you find regarding the overall economic performance of the Harrington units?

A Again, using data provided by SPS, I calculated that the Harrington units also incurred net losses relative to the market in the years 2015 through 2018. Table 2 shows that the three Harrington units lost at least $16 million relative to the market in each year from 2015 through 2018, with combined losses relative to the market as high as $75 million in 2016 alone. Total losses relative to the market over the four-year period were $230 million dollars combined for Harrington's three units.

Table 2. Net annual revenues of Harrington 1-3, 2015-2018 ($Million)

Unit	2015	2016	2017	2018	Total
Harrington 1					
Harrington 2					
Harrington 3					
Total					

Source: Workpaper of B. Weeks, SO - _SPS_SCENARIO2_REDUXOPS_2031.xlsx, Exhibit SPS-SC 1-9(k) and Response to SPS-SC 1-9(p), Exhibit SPS-SC 1-9(f) and Exhibit SPS-SC 1-9(i).

Q Describe how you arrived at the values in Table 1 and Table 2.

A The net revenue values in Table 1 and Table 2 are based on data provided by SPS. This includes data on Tolk and Harrington's respective energy revenues, ancillary services revenues, fixed O&M costs, variable costs, fuel costs, environmental capital costs, non-environmental capital costs, and property taxes. I calculated annual net revenues by subtracting fixed O&M costs, variable costs, fuel costs, environmental capital costs, non-environmental capital costs, and property taxes from energy revenues and ancillary services revenues.

SPS provided some of the data at the unit level. This includes energy revenues, ancillary services revenues, and property taxes.[7] Fixed O&M costs, variable costs, fuel costs, environmental capital costs, and non-environmental capital costs were provided at the plant-level.[8] I converted plant-level fuel costs and variable costs using a simple ratio of each unit's annual generation relative to the plant's total

[7] Exhibit SPS-SC 1-9(k); SPS Response to SPS-SC 1-9(p) (*see* Exhibit DG-2).

[8] Exhibit SPS-SC 1-9(f); Exhibit SPS-SC 1-9(i) (*see* Exhibit DG-2).

annual generation in gigawatt-hours (GWh).[9] Similarly, I converted plant-level fixed O&M costs, environmental capital costs, and non-environmental capital costs using a ratio of each unit's share of the plant's total capacity in megawatts (MW).[10]

Q Would the results change if you included a capacity value in the calculations?

A We did not include a capacity value in the preceding analyses because SPP does not have a capacity market. If we were to try to include SPS's savings from not acquiring capacity from other sources, net losses would be slightly smaller. Nonetheless, both plants would still have net losses relative to the market in each historical year I evaluated.[11] I valued capacity at the price SPS earns for firm capacity sales (according to the Strategist model output)[12] and found that the value of the capacity from Tolk and Harrington (in $2018) would be $10.3 million and $9.8 million, respectively, annually in each year from 2015 through 2018. Thus, that capacity value is still significantly below the net losses that each plant incurred in each year from 2015 through 2018. When I add a capacity value into the equation, Tolk's total losses relative to the market over the four-year period are $117 million and Harrington's total losses are $191.

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[9] I relied on annual generation data from the Strategist outputs included as workpapers with witness B. Weeks' Direct Testimony on Behalf of SPS. Specifically, I relied on data from "SO - _SPS_SCENARIO2_REDUXOPS_2031.xlsx".

[10] Source of unit-level capacity data: https://www.xcelenergy.com/energy_portfolio/electricity/power_plants/harrington; https://www.xcelenergy.com/energy_portfolio/electricity/power_plants/tolk.

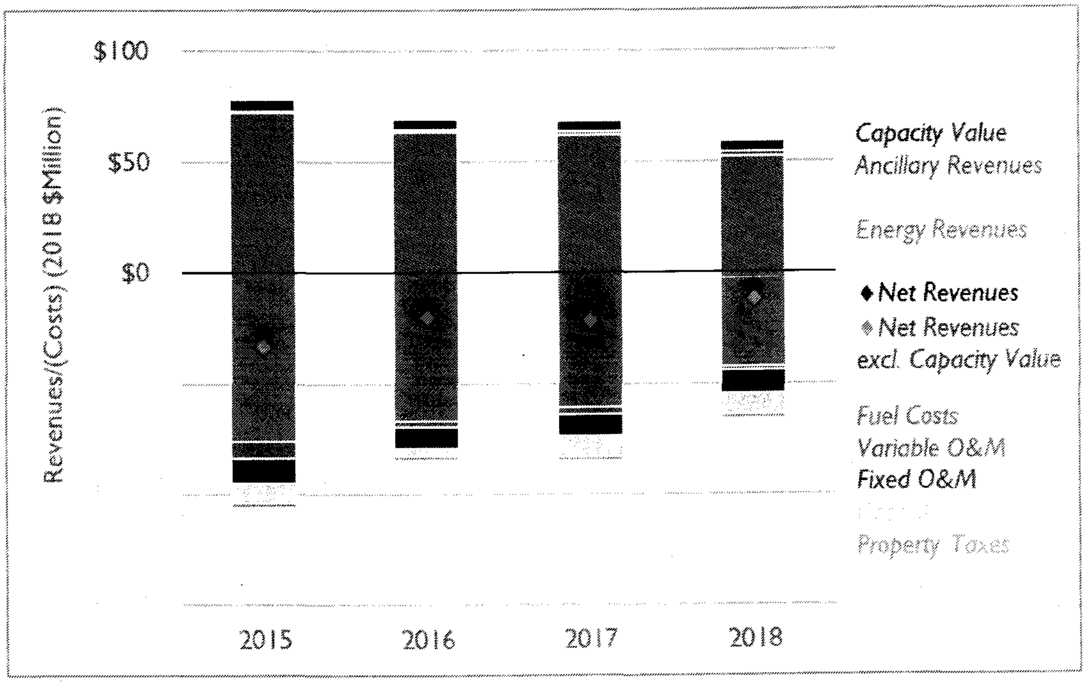
[11] On a unit level, all units with the exception of Harrington 2 in 2018, would have net losses.

[12] Workpaper of B. Weeks, SO - _SPS_SCENARIO2_REDUXOPS_2031.xlsx.

Q Is it possible to present the results from Tables 1 and 2 above to show each cost and revenue component of your analysis including the capacity value?

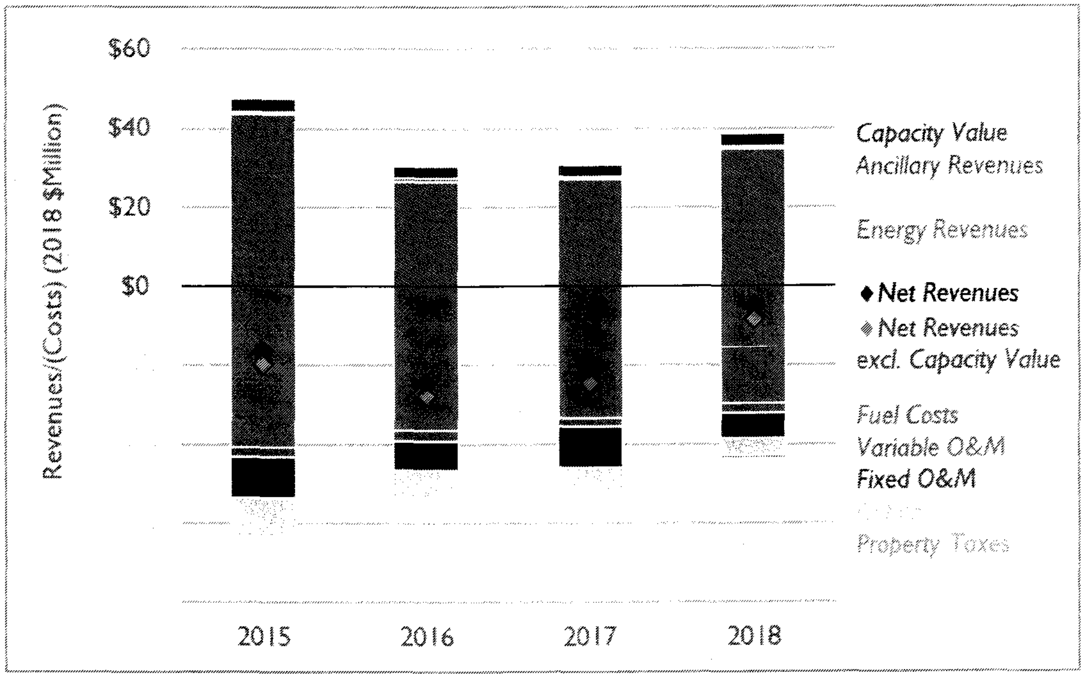
A Yes. Figure 1 and Figure 2 present the results of the historical analysis for Tolk 1 and Harrington 1 with each cost and revenue component shown separately, including the capacity value discussed above. The results for Tolk 2, Harrington 2, and Harrington 3 show a similar pattern. Because they are so similar, I do not produce them here due to space considerations. Figure 1 and Figure 2 illustrate that, in many years, the units' annual fuel costs alone approach or exceed the units' annual revenues.

Figure 1. Annual net revenues of Tolk 1, 2015-2018



Source: Workpaper of B. Weeks, SO - _SPS_SCENARIO2_REDUXOPS_2031.xlsx, Exhibit SPS-SC 1-9(k) and Response to SPS-SC 1-9(p), Exhibit SPS-SC 1-9(f) and Exhibit SPS-SC 1-9(l) (see Exhibit DG-2).

Figure 2. Annual net revenues of Harrington 1, 2015-2018



Source: Workpaper of B. Weeks, SO - _SPS_SCENARIO2_REDUXOPS_2031.xlsx, Exhibit SPS-SC 1-9(k) and Response to SPS-SC 1-9(p), Exhibit SPS-SC 1-9(f) and Exhibit SPS-SC 1-9(i) (see Exhibit DG-2).

Q Would SPS be justified in keeping a unit online that was operating at an average annual loss relative to the market over multiple years?

A No. As I will discuss in the next section, SPS could be justified in operating Tolk or Harrington at a loss relative to the market on an hourly, daily, or potentially monthly basis in order to meet peak demand, or conceivably for reliability reasons. However, it is not reasonable to operate a plant for years at a time if the operator cannot earn enough revenue from the market to cover the costs to operate and maintain the plant. To justify operation, generation resources should, on average, be able to earn enough per kilowatt-hour from the market to cover the variable operations costs, plus a small amount each towards the fixed and capital costs needed to maintain the plant. Otherwise, the Company could more economically procure energy for its customers from the market.

Q Do your findings regarding the recent net losses incurred by SPS's coal units indicate that the Company should retire all five of those units immediately?

A No. There are likely sound logistical and reliability-related reasons to not retire SPS's entire coal fleet at once. In addition, retiring one or more coal units may improve the economics of the remaining coal units. Also, past losses relative to the market are not a guarantee of future losses relative to alternative resource options. Given the recent net losses of SPS's coal units relative to the market, however, the Company should conduct rigorous economic assessments of near-term retirement dates for each of those units.

ii. Tolk and Harrington often did not earn enough revenue even to cover variable operational costs from 2015 through 2018

Q Please explain the purposes of this section, including the difference between its analysis and the analysis above in Section (i).

A In Section (i), I reviewed the total cost to operate and maintain Tolk and Harrington relative to procuring energy from the market. That analysis evaluated the combination of variable operational costs, fixed costs, and capital costs, and then compares the total cost to keep the plant online to the cost of procuring energy from the market. That type of analysis is relevant for determining whether a plant should be kept online or retired and replaced with an alternative.

In this section, by contrast, I review the variable operations costs (including fuel) and evaluate whether the plant is covering even the incremental cost to operate the unit each hour. This type of analysis is relevant for evaluating a plant's dispatch practices, and it sets up evaluation of the reasonableness of SPS choosing to self-commit the units into the wholesale energy market. I discuss this further in Section (iii), below.

Q Please summarize your findings regarding the operational economic performance of the Tolk units in the years from 2015 through 2018.

A Using data provided by SPS, I calculated that each of the Tolk coal units incurred net operational losses relative to the market in multiple years from 2015 through 2018 (Table 3). Net operational losses result when the sum of the hourly fuel and variable O&M costs over a given year are greater than the sum of the hourly nodal locational marginal prices ("LMPs") during all hours the unit is generating energy. Combined, these two units experienced annual net operational losses over half of the time, with the highest annual net operational loss of $10 million occurring in 2015 at Tolk 1.

Table 3. Annual net operational revenues of Tolk 1 and 2, 2015-2018 (2018 $Million)

Unit	2015	2016	2017	2018	Total
Tolk 1			($0)	$10	
Tolk 2	$17	$2			$12
Total	$6			$6	$6

Source: Workpaper of B. Weeks, SO - _SPS_SCENARIO2_REDUXOPS_2031.xlsx, Exhibit SPS-SC 1-9(k) and Response to SPS-SC 1-9(p), Exhibit SPS-SC 1-9(f) and Exhibit SPS-SC 1-9(i) (see Exhibit DG-2).

Q Please summarize your findings regarding the operational economic performance of the Harrington units in the years from 2015 through 2018.

A Using the same data provided by SPS discussed above, I calculated that each of the Harrington coal units incurred annual net operational losses in multiple years from 2015 through 2018. Table 4 shows that each of the Harrington units incurred aggregate operational losses of more than $7 million from 2015 through 2018.

Together, the units incurred net operational losses of $35 million from 2015 through 2018. This means that customers would have saved money over this time period if SPP had purchased energy from the market rather than operating its coal units.

Table 4. Annual net operational revenues of Harrington 1, 2, and 3, 2015-2018 (2018 $Million)

Unit	2015	2016	2017	2018	Total
Harrington 1	$1			$3	
Harrington 2				$11	
Harrington 3				$4	
Total				$18	

Source: Workpaper of B. Weeks, SO - _SPS_SCENARIO2_REDUXOPS_2031.xlsx, Exhibit SPS-SC 1-9(k) and Response to SPS-SC 1-9(p), Exhibit SPS-SC 1-9(f) and Exhibit SPS-SC 1-9(i) (see Exhibit DG-2).

Q Describe how you arrived at the values in Table 3 and Table 4.

A I arrived at the net operational revenue values in Table 3 and Table 4 by subtracting each of the Tolk and Harrington units' 2015–2018 variable O&M costs and fuel costs from its energy revenues and ancillary services revenues. Each of these costs and revenues were directly provided by SPS, as described in Section 3i.

iii. SPS's decision to self-commit its units to dispatch in the market has resulted in the uneconomic operation of Tolk and Harrington, at avoidable expense to ratepayers

Q Please provide a summary of this section.

A In this section, I discuss some of the decisions and dynamics underlying the annual net operational losses identified in Section 3ii. Specifically, I show how

SPS's operational decision-making is biased in favor of running its coal plants to generate energy rather than serving its load with energy available at lower cost in the market. Running SPS coal plants to serve load has resulted in higher costs to ratepayers.

Q How does SPS typically operate the Tolk and Harrington units?

A SPS operates its coal units in the SPP energy market with the units' commitment statuses set to "Self-Commit" most often, and "Economic" or "Outage" each less often. When a unit is set to "Self-Commit" status, a utility decides in advance that it will operate the unit at its minimum operational level or higher regardless of market prices. Conversely, when a unit is set to "Economic" status, the utility is indicating that it will only operate the plant if it is selected based on the day-ahead market results. This means that the utility bids in the price to operate the unit, based on its variable and fuel costs in each hour, and the unit is selected if the bid price is lower than the bid price of the marginal unit (the last unit needed to meet demand in that hour).

Table 5 shows that each of Tolk's two units was set to Self-Commit for at least [redacted] of the hours in each year from 2016 through 2018, and in some years considerably more. For Harrington, Table 6 shows that, on average from 2016 through 2018, each of the three units was set to Self-Commit for [redacted] of the hours (in the case of Harrington 2, substantially more).

Table 5. Tolk commitment practices, 2016-2018 CONFIDENTIAL

[redacted]

Source: Exhibit SPS-SC 2-6(b)(CONF)(CD) (see Exhibit DG-2).

Table 6. Harrington commitment practices, 2016-2018 CONFIDENTIAL

[redacted]

Source: Exhibit SPS-SC 2-6(b)(CONF)(CD) (see Exhibit DG-2).

Q **Describe how you arrived at the values in Table 5 and Table 6.**

A I relied on unit-level hourly commitment status data provided by SPS to arrive at the values shown in Table 5 and Table 6. For each unit, I calculated the total number of hours of data provided for each year, and the number of hours each unit's commitment status was set to Economic, Outage, Reliability, and Self-Commit. Finally, I divided the hours for each commitment status by total hours of data to arrive at the percentage of hours that each unit was set to a given commitment status.

Q **How does SPS describe its unit-commitment practices?**

A SPS asserts that "under most market operating conditions, SPS offers the Tolk and Harrington units into the SPP Integrated Market ("IM") in "market status" which allows the SPP IM to economically commit and dispatch the units according to market needs." SPS further indicates that it will "'self-schedule' Tolk and Harrington units under certain conditions…"[13] As a matter of fact, however, most of the time SPS does *not* offer the Tolk or Harrington units in 'Market' (by which the Company presumably means to suggest 'Economic' status) as illustrated above. The Company offers no clear explanation for the discrepancy between how it describes its dispatch practices and how it actually dispatches its plants.

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[13] SPS Response to SC 2-8 (*see* Exhibit DG-2). "SPS will 'self-schedule' Tolk and Harrington units under certain conditions such as required environmental emissions testing, unit performance testing, coal bunker management for safety purpose, and to ensure adequate reserve margins for system reliability under high demand and adverse weather conditions that jeopardize the renewable energy production; such as extreme hot or cold weather, icing, wind over speed, cold and hot temperatures cut outs of the wind turbines and potential impacts to natural gas supplies for the SPS generating fleet."

Q Do you have concerns with SPS's commitment practices?

A Yes. SPS's claim that it offers Tolk and Harrington in Market status under most operating conditions is not supported by the Company's own dispatch record, in which the Company has clearly designated the units with a Self-Commit status [redacted] (see Table 5 and Table 6).[14] In the past, when natural gas prices were higher and renewable prices were still coming down, the coal plants may have actually been earning enough revenue to cover their operational costs during a majority of hours. (Note this does not mean that the units were covering their fixed and capital costs, and were therefore overall economic to operate.) In this context, applying a Self-Commit status would not have had as large an impact on market conditions as it would today. However, the modern market environment is driven by persistently low gas prices and greater levels of zero-marginal-cost renewables such as wind and solar. In this context, the coal units are actually uneconomic to operate during a large portion of the year, and SPS's continued bias in favor of committing and dispatching them is costing ratepayers millions of dollars a year.

Q Have other entities raised concerns about self-commitment in the SPP region?

A Yes. The SPP Market Monitor raised this concern in its 2018 *State of the Market* report, in which it states: "Self-commitment of generation continues to be a concern because it does not allow the market software to determine the most economic market solution. Furthermore, it can contribute to market uplifts and

[14] Exhibit SPS-SC 2-6(b)(CONF)(CD) (*see* Exhibit DG-2).

low prices."[15] The SPP Market Monitor's report further states that it continues to "view reducing self-commitment of generation as a high priority for SPP and its stakeholders as this will enhance market efficiency and improve price signals."[16]

Moreover, public utilities commissions in both Minnesota and Missouri have opened formal dockets to investigate utility self-dispatch practices.[17] Additionally, the Sierra Club recently published a report outlining the problems that self-commitment and uneconomic dispatch pose in wholesale energy markets (known as "ISOs" or "RTOs").[18]

Q Have you conducted any additional analyses that explore the frequency with which SPS operates its units at a loss, beyond the economic analysis presented above in Section 3(ii)?

A Yes. I used data provided by SPS to determine the number and percentage of hours in which each unit operated when the hourly unit-level LMP was less than the unit's variable O&M costs and fuel costs.[19] This analysis is similar to what I

[15] Exhibit DG-3, Southwest Power Pool - Market Monitoring Unit, *State of the Market 2018* at 5 (May 15, 2019), *available at*: https://www.spp.org/documents/59861/2018%20annual%20state%20of%20the%20market%20report.pdf.

[16] *Id.*

[17] *See* Missouri Public Service Commission, Docket No. EW-2019-0370; Minnesota Public Utilities Commission, Dockets Nos. E999/AA-17-492 and E999/AA-18-373.

[18] Exhibit DG-4, Fisher, Jeremy, *et al., Playing With Other People's Money: How Non-Economic Coal Operations Distort Energy Markets,* Sierra Club (October, 2019), *available at:* https://www.sierraclub.org/sites/www.sierraclub.org/files/Other%20Peoples%20Money%20Non-Economic%20Dispatch%20Paper%20Oct%202019.pdf.

[19] I relied on: hourly unit-level generation data provided in Exhibit SPS-SC 1-10(a)(CD); hourly unit-level day-ahead LMP data provided in Exhibit SPS-SC 2-6(i)(CD); unit-level variable O&M costs data provided in Exhibit SPS-SC 2-6(g)(CONF)(CD), provided at irregular intervals but with at least one unit-level datum per year; and monthly plant-level fuel costs data provided in Exhibit SPS-SC 1-10(b) (*see* Exhibit DG-2).

presented in Section 3(ii), except here I focus on the frequency of hourly results rather than net annual results. Specifically, I calculated the percentage of annual operational hours in which each unit's fuel costs alone are greater than the unit's LMP. Then I added in each unit's variable O&M costs and calculated the percentage of hours where the combined variable and fuel costs exceed the unit's LMP.

Q What did you find about the frequency with which SPS operates the Tolk and Harrington units at a loss?

A I found that in 2016 and 2017, for more than [redacted] of the operational hours at Harrington and Tolk, the units' estimated[20] fuel costs were greater than the units' LMP (Figure 3). When I added in the estimated variable O&M costs to the fuel costs, that percentage increased to [redacted] of the time (Figure 4). Plant performance for both Tolk and Harrington appears to improve in 2018, but this is due in large part to the LMP spike in 2018. There is no reason to believe that LMPs will remain at this level; in fact, the average day-ahead energy prices were 10 percent lower this summer (2019) than they were in the summer of 2018.[21] It is important to note that for Tolk, this slight improvement in 2018 was also concurrent with SPS introducing an Opportunity Cost Calculator (OCC) at Tolk to alter the offer price to reduce dispatch and conserve water.[22] It is concerning that the combination of the OCC and the high LMPs only slightly

[20] Estimated because fuel costs data was provided on a monthly basis only.

[21] Exhibit DG-5, Southwest Power Pool - Market Monitoring Unit, *State of the Market Report, Summer 2019* at 2 (Oct. 25, 2019), *available at*: https://www.spp.org/documents/60882/spp_mmu_qsom_summer_2019.pdf.

[22] OCC was introduced in April 2018. SPS Response to SC 2-5 (*see* Exhibit DG-2).

improved unit performance. This indicates that even when the plant switches to seasonal operations, its fuel and variable costs could still likely exceed its LMPs.

Figure 3. Percent of operational hours where estimated fuel costs were greater than LMP, 2016-2018 CONFIDENTIAL

[redacted]

Source: Exhibit SPS-SC 1-10(a)(CD); Exhibit SPS-SC 2-6(i)(CD); Exhibit SPS-SC 2-6(g)(CONF)(CD); Exhibit SPS-SC 1-10(b) (see Exhibit DG-2).

Figure 4. Percent of operational hours where estimated fuel costs plus variable O&M costs were greater than LMP CONFIDENTIAL

[redacted]

Source: Exhibit SPS-SC 1-10(a)(CD); Exhibit SPS-SC 2-6(i)(CD); Exhibit SPS-SC 2-6(g)(CONF)(CD); Exhibit SPS-SC 1-10(b) (see Exhibit DG-2).

Q Is there a monthly or seasonal trend in uneconomic dispatch by SPS?

A Yes, as shown in Table 7 and Table 8, all units operated uneconomically during a larger portion of the off-peak season hours—namely, October through May—compared to the on-peak season hours—June through September. Below, Table 7 shows the estimated percentage of peak and off-peak season hours when just the units' fuel costs were larger than the units' LMP. Table 8 shows the percentage of peak and off-peak season hours when the units' total variable operational costs, which includes fuel and variable O&M costs, were larger than the units' LMP.

Table 7. Operating hours with fuel costs > LMP (%) by peak season and off-peak season CONFIDENTIAL

[redacted]

Source: Exhibit SPS-SC 1-10(a)(CD); Exhibit SPS-SC 2-6(i)(CD); Exhibit SPS-SC 2-6(g)(CONF)(CD); Exhibit SPS-SC 1-10(b) (see Exhibit DG-2).

Note: Peak season is defined as June–September; Off-peak is defined as October–May.

Table 8. Operating hours with total operational costs > LMP (%) by peak season and off-peak season CONFIDENTIAL

[redacted]

Source: Exhibit SPS-SC 1-10(a)(CD); Exhibit SPS-SC 2-6(i)(CD); Exhibit SPS-SC 2-6(g)(CONF)(CD); Exhibit SPS-SC 1-10(b) (see Exhibit DG-2).

Q Do you know how the magnitude of total operational losses or revenues break down by peak and off-peak season?

A No. We know total annual net operational losses (or revenues), which I presented in Section 3(ii). However, we do not know how those losses break down by season because SPS has not provided data on hourly costs (which Sierra Club requested).[23] Without these more granular, hourly data, we are unable to calculate operational losses by season. To be clear, the data in Table 7 and Table 8 tell us about the estimated *frequency* of uneconomic operation, but not the *magnitude*. This means we do not know if, on the whole, the Tolk and Harrington units are actually covering operational costs during the peak season (but not off-peak season), or if they are uneconomic during both seasons. The Commission should require SPS to produce this information to evaluate the reasonableness of the seasonal operation plan for Tolk, and to help determine whether seasonal operation at Harrington would benefit ratepayers relative to continued full-year operations.

Q What are the implications of this section's findings of uneconomic plant operations and unit commitment decision-making by SPS?

A These results indicate that, in many hours over the past three years (the historical years for which SPS provided data), SPS is often committing and dispatching its units in ways that result in net operational losses. This means the plants are not even covering their operational costs, let alone earning enough to cover the fixed and capital costs required to make the plant economic and reasonable to keep online. Moreover, these losses could have been avoided or mitigated by choosing not to offer the units into the SPP market in self-commit status—at the least during the off-peak season. The years with net operational losses represent extreme cases of uneconomic operations (relative to years when the plants covers operational costs, but do not fully cover fixed and capital costs). These findings

[23] Fuel costs were provided as monthly averages, and variable O&M costs were provided for only a few hours per unit for the years 2016 through 2018. Exhibit SPS-SC 2-6(g)(CONF)(CD); Exhibit SPS-SC 1-10(b) (*see* Exhibit DG-2).

indicate that SPS is imprudently making its unit commitment and operations decisions. In doing so, the Company is incurring net operational losses that it passes on to its retail ratepayers.

Q What are your recommendations to the Commission with regard to SPS's request for O&M for Tolk and Harrington?

A I recommend that the Commission disallow recovery of a portion of the requested test year O&M costs from April 1, 2018–March 31, 2019 for Tolk and Harrington on the basis that the plants have been, on average, failing to cover even their operational expenses. Specifically, the Commission should disallow recovery of O&M associated with the units' uneconomic self-commitment dispatch practices. To calculate the exact amount to disallow, I recommend that the Commission require SPS to first calculate total operational revenues or losses on a monthly basis. For the months with net uneconomic operations, the Commission should disallow the increment of cost incurred to operate and dispatch the unit that is over and above the cost at which SPS could have purchased energy from the market.[24]

I further recommend that the Commission investigate whether costs have been improperly passed on to customers due to uneconomic self-commitment and dispatch of Tolk and Harrington through a docket dedicated to the issue. At a minimum, the Commission should make clear that it will continue to evaluate the issue in future proceedings, including in SPS's fuel and purchased power cost adjustment clause ("FPPCAC"), rate, and planning dockets.

[24] Alternatively, the Commission would disallow just the portion of O&M incurred to operate the units during the hours they are operating uneconomically in self-commit mode.

4. <u>TOLK AND HARRINGTON ARE LIKELY TO CONTINUE TO BE UNECONOMIC INTO THE FUTURE, AT UNNECESSARY COST TO RATEPAYERS</u>

Q Please provide a summary of this section.

A In this section I evaluate the likely future economic performance of both Tolk and Harrington using the forward-going cost projections and power prices provided by SPS.[25] First, I calculate projected future net revenues or losses for each unit and find that continued operation of both Tolk and Harrington is likely to result in substantial losses to ratepayers from 2020-2032. Then, to back up these findings, I compare just the Company's projected costs to the revenues that would be required to avoid operating at an economic loss, *i.e.*, "break-even revenues." I compare the results to the historical revenues, and I find that both Tolk and Harrington would need to earn significantly more revenue than each unit has historically to avoid continuing operating at a loss.

[25] After the close of business on November 21, 2019, the evening before the filing deadline for this testimony, SPS provided a supplemental discovery response to SC 3-1, in which the Company admitted that it erroneously designated May as a "summer peak" month in its Tolk Strategist analysis. Given the late disclosure and the fact that SPS has not provided the updated Strategist output results for our review, or an update to the monthly data requested in SC 3-1, I was unable to incorporate the new information into this testimony.

I will note, however, that SPS's error appears to have biased the Company's analysis in favor of continuing to operate Tolk, for at least two reasons. First, since the plant will be operating only four months, rather than five, that means SPS will receive approximately 20% less annual revenue (even though variable O&M and fuel costs drop by the same percent, SPS relies on projected power market prices that are higher than projected fuel and variable costs) . Second, since the additional year of operation will be when the water shortage is most extreme, the extended operation may require additional wells and associated costs. In light of SPS's corrected discovery response, I reserve the right to supplement or amend my testimony and conclusions, as may be appropriate.

Q Using the data provided by SPS, what can you say about the likely future economic performance of both plants?

A I find that both Tolk and Harrington are very likely to lose ratepayers a substantial amount of money between 2020 and 2032. Specifically, I find that Tolk could lose anywhere between $8 million and $234 million and Harrington could lose between $49 and $510 million between 2020 and 2032, depending on how often each plant is dispatching during on-peak and off-peak times.[26] Based on the likely scenario that each plant dispatches two-thirds of its monthly generation during on-peak hours, and one-third during off-peak hours (Table 9), I find that Tolk is likely to lose $88 million and Harrington is likely to lose $202 million between 2020 and 2032.

[26] The upper and lower bounds associated with dispatching 100% of generation during on-peak hours or 100% during off-peak hours are not feasible because start-up and shut-down costs would prevent the units from operating in this manner. In reality, a portion of each unit's generation will be dispatched during on-peak hours, and a portion off-peak.

Table 9. Projected net revenues (losses) assuming 2/3 of generation is dispatched during on-peak hours and 1/3 during off-peak hours

[redacted]		
Tolk 1	$14	
Tolk 2		
Harrington 1		
Harrington 2		
Harrington 3		

Source: SPS response to SC 1-23; SPS response to SC 3-1; Workpaper of B. Weeks, "SO -_SPS_SCENARIO2_REDUXOPS_2031.xlsx"; SPS response to SC 1-26 (see Exhibit DG-2).

Q Describe how you calculated the values in Table 9.

A I calculated the forward-going costs the Tolk and Harrington units are projected to incur based on adding together the fuel costs, variable O&M costs, fixed O&M costs, and ongoing capital costs—including the costs to drill additional wells at Tolk (allocated evenly between Units 1 and 2)—provided by Company witness B.F. Weeks in the Strategist output files.[27] I then calculated energy revenue using monthly generation data from the Tolk Strategist model[28] and the monthly on and off-peak power prices provided by SPS for SPP South.[29] I assumed that two-thirds of monthly generation was dispatched during on-peak hours, and one-third was dispatched during off-peak hours.

[27] Workpaper of B. Weeks, "SO -_SPS_SCENARIO2_REDUXOPS_2031.xlsx."

[28] SPS Response to SC 3-1 (*see* Exhibit DG-2).

[29] SPS Response to SC 1-26 (*see* Exhibit DG-2). SPS provided projected power prices for several locations; however, given the location of Tolk and Harrington in SPP south, I selected the prices for this location.

Q **SPS's data seems to indicate that Tolk will become more economic after 2025. Do you think this is accurate and does this support continued operation of the plant?**

A No. First, the plant is projected to lose significant money relative to the market between now and 2025. Those losses far outweigh the projected net revenues. Second, projected revenues are based on power market price projects that are increasingly uncertain as you get further out. Finally, the Company appears to be understating the costs to maintain access to sufficient water at Tolk based on the Company's recent historical spending on water supply and water availability projects at Tolk. While it is reasonable for SPS to project lower O&M costs when the plant switches to seasonal operation, and to avoid spending on large capital projects as the plant nears retirement, [30] SPS's projection of future capital investments needs to reflect the full likely costs to maintain access to sufficient water. Between 2014 and 2017, SPS spent $11.2 million on water supply and water availability-related capital investments, and the Company has spent an additional $4.9 million since the beginning of 2019. [31] Going forward, SPS projects spending an average of only $1 million annually on water projects at Tolk.[32]

[30] With a switch to seasonal operation, SPS will have to recover the fixed and capital costs over a smaller portion of hours. However, SPS asserts that with a switch to seasonal operation, O&M will be lower and "the interval between [capital] projects can be extended." Further, SPS states that "all capital projects in the later years will be evaluated for the need during managed decline phase of the units." SPS Response to SC 1-23 (*see* Exhibit DG-2).

[31] SPS Response to SC 1-24 (*see* Exhibit DG-2).

[32] Workpaper of B. Weeks, "SO -_SPS_SCENARIO2_REDUXOPS_2031.xlsx".

Q **Given the uncertainty about future conditions, have you performed any other analysis to support your findings above?**

A Yes. I have also performed break-even analysis to focus on just SPS's projected costs, and the revenue required to cover those costs. The analysis I presented above, comparing projected future costs and revenues for each unit, relies on uncertain power price projections years into the future. This analysis also required me to make a key assumption about when each unit was dispatching. The analysis answers the question, "Based on the power prices and costs provide by the Company, and your assumptions around unit dispatch, what is the likely economic performance of each unit." The break-even analysis, on the other hand, is based almost entirely on the Company's information and involves minimal additional operational assumptions. It answers the question, "What assumptions about future power prices are needed for the analysis to show positive net revenues, given the Company's assumptions around future costs, in order for the plants to earn net revenues."

Q **What is a break-even analysis?**

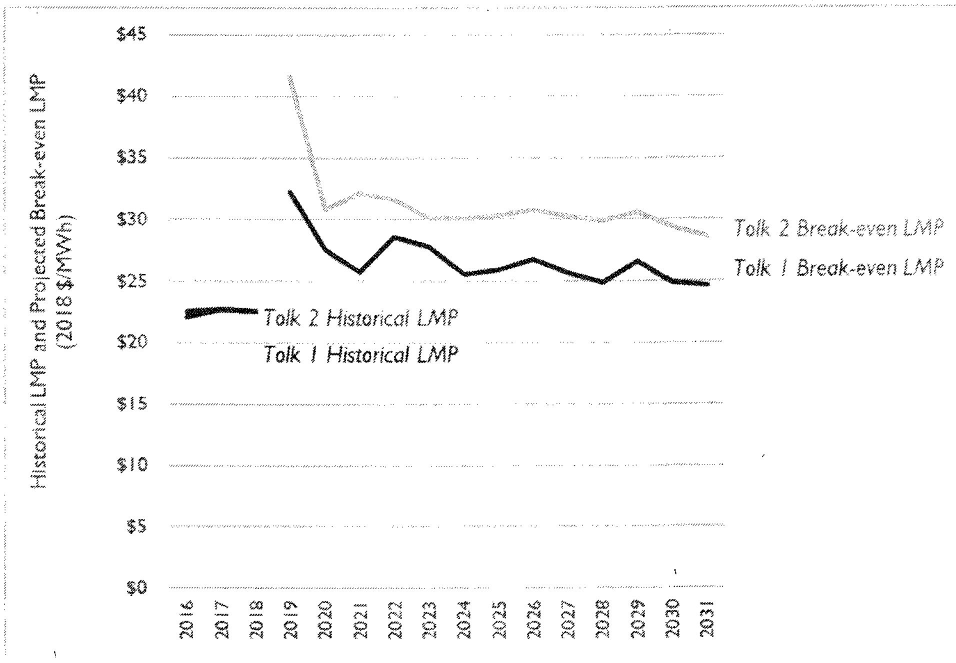
A A break-even analysis in this context calculates the LMP or the revenue that is required for the plant's revenues to exactly equal its operational costs (fuel and variable O&M). The break-even LMPs can be thought of as the minimum average LMP a unit must receive for generation in order to not lose money during a given year. If the actual, average LMPs during a year are less than the break-even LMP, the unit would operate at 1-256a loss. Break-even total revenue can be thought of as the minimum total revenue that a plant must earn in a year, based on the calculated LMPs and the likely projected future generation levels.

Q Please summarize your findings regarding the future economic performance of the Tolk units.

A Using future cost and generation projections provided by SPS,[33] and historical LMPs from SPP,[34] I find that the Tolk units will need to receive an average LMP that significantly exceeds average peak-season LMPs from the recent past (2015–2018) to avoid operating at an economic loss (Figure 5). I present the forward-going costs as the hourly LMP that the Tolk units would need to earn. I compared these projected LMPs to historical annual average hourly LMP for each unit from the months of June through September based on hourly unit-level LMPs from the SPP from 2015 through 2018. SPS has presented no evidence or projections that indicate that the Company believes future LMPs will increase to the level required to make sustained operation of Tolk economic.

[33] Workpaper of B. Weeks, "SO -_SPS_SCENARIO2_REDUXOPS_2031.xlsx."
[34] *Available at*: https://marketplace.spp.org/pages/rtbm-lmp-by-location.

Figure 5. Tolk Units 1 & 2 historical and future break-even LMPs, 2015–2032



Source: Source: Workpaper of B. Weeks, "SO -_SPS_SCENARIO2_REDUXOPS_2031.xlsx."

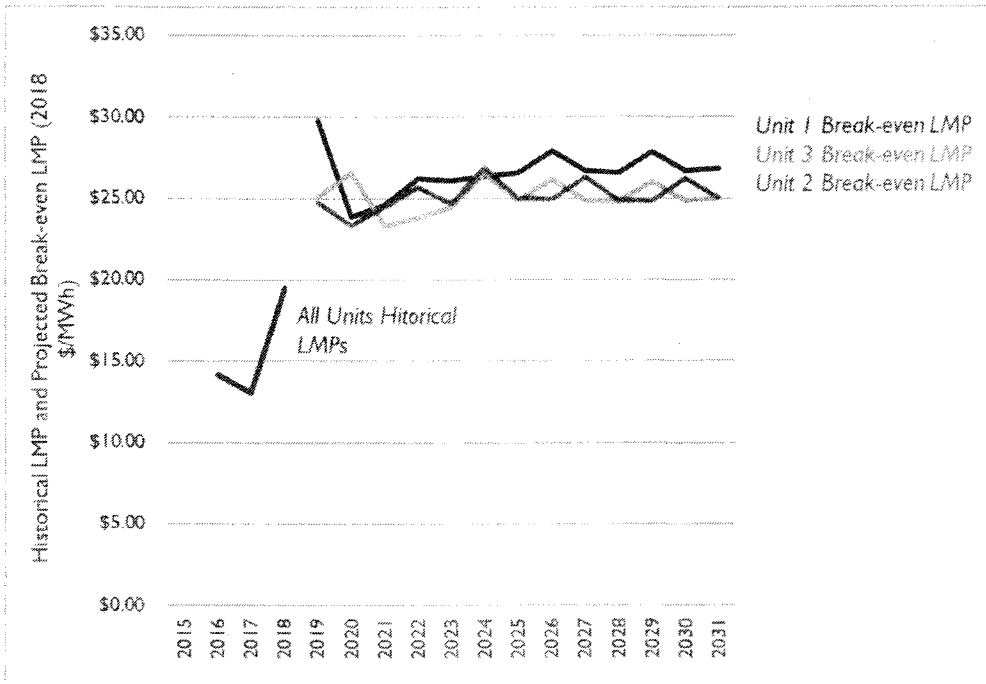
Note: Historical LMPs represent the average of the hourly LMPs for only the four on-peak months that SPS plans to operate Tolk beginning 2020 (June through September).

Q Please summarize your findings regarding the future economic performance of the Harrington units.

A Using the same data provided by SPS, I calculated the forward-going costs that the Harrington units are projected to incur through 2032, and therefore the revenues and LMPs that the Harrington units would need to receive to operate economically. Figure 6 shows that for the Harrington units to avoid operating at a loss they would need to receive annual average LMPs in most years that exceed the annual historical average LMPs they received from 2015 through 2018. Despite the 2018 spike in SPP energy prices, there is no evidence to support an assumption that future revenues and LMPs will continue to increase to a level required to sustain economic operations. Using past LMPs as a proxy for future

LMPs, all three Harrington units would be operating at an economic loss in the majority of years through 2032.

Figure 6. Harrington Units 1–3 historical and future break-even LMPs, 2015–2032



Source: Workpaper of B. Weeks, "SO - _SPS_SCENARIO2_REDUXOPS_2031.xlsx."

Q **Describe how you arrived at the values in Figure 5 and Figure 6.**

A I calculated the forward-going costs the Tolk and Harrington units are projected to incur using the same data and methodology outlined in the first part of this section.[35] I used the projected annual costs for each unit net of the capacity value to estimate the level of annual revenues SPS would have to receive from the ancillary and energy markets in order to break even. That is, if the annual revenues for a unit were exactly equal to the annual costs, the unit would achieve

[35] Workpaper of B. Weeks, "SO - _SPS_SCENARIO2_REDUXOPS_2031.xlsx."

break-even economic status. However, if the annual revenues are less than the annual costs, the unit would be operating at a loss.

Because SPS plans to reduce operations at Tolk and operate the plant only from June through September (peak season) between 2020 and 2032,[36] it is not useful to directly compare forward-going break-even revenues with historical revenues.[37] Instead, I divided the calculated annual break-even revenues by projected generation by unit—provided in SPS's Strategist output files[38]—to arrive at break-even LMPs. For consistency of analysis, I present the results from Harrington as a break-even LMP as well based on year-round operation.

Q Is there other analysis that supports your overall economic assessment of SPS's Tolk and Harrington Stations' forward-going economics?

A Yes. Analysis from SPP's Market Monitoring Unit (MMU) supports this assessment. SPP's 2018 *State of the Market* report describes coal plant economics within the SPP region and indicates that "…MMU analysis shows that market revenues do not support going forward costs for coal resources."[39]

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[36] Direct Testimony of B. Weeks at 22.

[37] Due to the reduced operations in the forward-going analysis, forward-going production costs will be lower than historical production costs, and consequently the break-even revenues will be less than historical revenues.

[38] Workpaper of B. Weeks, "SO -_SPS_SCENARIO2_REDUXOPS_2031.xlsx."

[39] Exhibit DG-3, Southwest Power Pool - Market Monitoring Unit, *State of the Market 2018* at 2 (May 15, 2019), *available at*: https://www.spp.org/documents/59861/2018%20annual%20state%20of%20the%20market%20report.pdf.

Q What are the implications of these uneconomic results for ratepayers?

A Based on SPS's own input assumptions, we find during two separate types of analysis, that Tolk and Harrington are very likely to continue operating at a loss going forward. This means that ratepayers will continue to pay for SPS to uneconomically operate the Company's coal fleet.

Q What are your recommendations to the Commission with regard to any request for recovery of future capital investments at Tolk and Harrington?

A Given that Tolk and Harrington will likely remain uneconomic, I recommend that the Commission preemptively deny recovery of the costs of any substantial future capital projects that may be intended to prolong the lives of Tolk and Harrington as generating assets. It is unreasonable for ratepayers to spend any more money to keep economically non-competitive plants online, particularly in light of the impending water shortages at Tolk.

5. TOLK CANNOT ECONOMICALLY PROCURE WATER TO OPERATE THROUGH ITS UNITS' CURRENT RESPECTIVE RETIREMENT DATES OF 2042 AND 2045

Q Please summarize this section.

A In this section I review SPS's request to adjust the depreciation dates of the two Tolk units based on a retirement date of 2032, accelerated from the current dates of 2042 for Unit 1 and 2045 for Unit 2. Specifically, I examine the Company's groundwater modeling and economic analysis and find that the modeling and analysis supports the Company's assertion that it cannot economically procure groundwater to maintain operations at Tolk through 2042 and 2045.

Q What is SPS's request regarding future operations of Tolk in this rate case?

A SPS requests the following relief:

- A change to the Tolk Station retirement dates from 2042 for Unit 1 and 2045 for Unit 2 to 2032 for both units, and a switch to seasonal operation starting in 2021.[40]
- A change in the depreciation lives of the Tolk Units to 2032 for generating purposes.[41]
- A depreciable life for the assets associated with Tolk's operation in synchronous condenser mode ending in 2055.[42]

Q Has SPS previously requested a change in the remaining useful life for Tolk?

A Yes, in SPS's last rate case, the Company requested to shorten the retirement dates for Tolk for depreciation purposes. However, SPS did not officially request a 2032 retirement date until this case.[43]

Q Why is SPS requesting a change in the remaining useful life date for Tolk?

A SPS is requesting a change to the retirement date, and plans to switch to seasonal operations at Tolk, due to the "continuing and irreversible decline of the Ogallala Aquifer."[44] SPS asserts that if Tolk continues to operate at current levels, economic depletion of the aquifer will occur between 2024 and 2026. Once

[40] Direct Testimony of W. Grant on Behalf of SPS at 8.
[41] Direct Testimony of M. Lytal on Behalf of SPS at 5-6.
[42] *Id.*
[43] Direct Testimony of W. Grant at 79.
[44] Direct Testimony of M. Lytal at 4.

economic depletion occurs, the cost to secure water through continued drilling of new wells or alternative procurement measures will make it uneconomic to ratepayers for SPS to continue operating the plant.[45]

Q What alternative solutions has SPS explored to procure the water needed to keep Tolk operating through its original retirement dates of 2042 and 2045?

A SPS explored alternative solutions in the prior rate case; specifically a water pipeline project with the City of Lubbock and the construction of hybrid cooling towers.[46] However, the City of Lubbock notified SPS that it is not able to provide Tolk the required quantity of water, and the construction of two hybrid cooling towers would be cost prohibitive at around $236 million.[47] Based on this and other assessments, SPS has asserted that "there is no feasible operational scenario that would allow SPS to economically maintain the Tolk generating units until the end of their currently approved service lives in 2042 and 2045."[48]

Q Has SPS already been facing water supply challenges at Tolk?

A Yes. As the Ogallala Aquifer is depleted and the level of saturated thickness drops,[49] SPS has had to drill an increasing number of wells to supply the water needed for peak operations. Tolk's well count has increased 207 percent since 1992, yet total wellfield production has declined by 25 percent during the same

[45] *Id.* at 38.

[46] Direct Testimony of W. Grant at 82.

[47] Company Witness Grant stated "SPS has determined that the installation of hybrid cooling towers at Tolk to be economically imprudent given the age of Tolk, the uncertainty and cost of the technology, and the potential for increased environmental costs that may occur at some point in the future." *Id.* at 83.

[48] Direct Testimony of M. Lytal at 81.

[49] The saturated thickness of the aquifer is defined as the distance from the water table to the base of the aquifer.

timeframe.[50] SPS hired an external firm, WSP USA, to perform its groundwater modeling. WSP's 2018 groundwater modeling concluded that SPS would have trouble extracting enough water from the wellfield to meet peak demand in the summer starting in 2019.[51]

Q Has Tolk undertaken any projects recently related to water supply access?

A Yes. Tolk added eight new wells between 2018 and 2019 to offset predicted production deficits from the current wells.[52] SPS acknowledged that the Company will need to continue regularly drilling new wells to sustain operation through 2031.[53]

Q Has SPS presented sufficient evidence to support its assertion that Tolk cannot feasibly maintain operations at current levels through the units currently approved service lives of 2042 and 2045?

A Yes. Based on groundwater data collected for the Company between 2007 and 2018,[54] and the Company's evaluation of alternatives, SPS has presented ample evidence to demonstrate that the costs of obtaining the water required to sustain operation through 2042 and 2045 far exceeds economic levels. In light of the rapidly deteriorating water supply, it is clear that the Tolk units should be retired

[50] At the time Tolk was built, the wellfield average flow was approximately 700 gallons per minute (gpm) per well; now the flow rate is approximately 200 gpm and projected to drop to between 50-80 gpm as the aquifer is further depleted. Direct Testimony of M. Lytal at 65.

[51] *Id. at* 64.

[52] *Id.* at 64.

[53] *Id.* at 76-77.

[54] Sources included 3-D modeling and other public data from the High Plains Water District ("HPWD"), modeling and data from the United States Geological Survey, semi-annual wellfield productivity test, and groundwater modeling from the firm WSP.

by 2032 *at the latest*. Indeed, our analysis of the Company's own data makes clear that customers would save money by retiring the plant even sooner. Based on this, I recommend that the Commission approve a retirement (and depreciation) date for Tolk no later than 2032, or ideally earlier.

6. SPS HAS NOT DEMONSTRATED THAT SEASONAL OPERATION OF TOLK THROUGH 2031 IS THE LOWEST-COST OPTION FOR SERVING CUSTOMERS' NEEDS

Q Please summarize this section.

A In this section I first explain SPS's proposal to conserve water by operating Tolk seasonally as a generator from 2020 through 2031, and by operating the unit as a synchronous condenser in the off-peak season. I summarize the groundwater modeling and Strategist analysis upon which SPS relied and outline my concerns with the groundwater modeling and economic analysis. Then, in Section (i), I review how the risk of water shortage is incorporated into SPS's water model. In Section (ii), I discuss an alternative use for the water currently used at Tolk. In Section (iii), I outline how water shortages can impact modeling of peak capacity. In Section (iv), I review the Company's Tolk Strategist analysis. Finally, in Section (v), I outline how to incorporate each of the water-related risks and opportunities into the Company's economic analysis.

Q Please explain SPS's proposed seasonal operation plan at Tolk between now and the proposed retirement date of 2032?

A To conserve the economically recoverable water to which Tolk has access, and to extend the life of the plant to maintain the capacity value of the plant, SPS is