STATE OF MINNESOTA PUBLIC UTILITIES COMMISSION

Katie J. Sieben Daniel Lipschultz Valerie Means Matt Schuerger John Tuma Chair Commissioner Commissioner Commissioner

In the Matter of the Petition for approval of Northern States Power Company, dba Xcel Energy, for approval of its Community Solar Garden Program July 19, 2019

MINNESOTA SOLAR ENERGY INDUSTRIES ASSOCIATION'S COMMENTS

Docket No. E-002/M-13-867

COMMENTS OF THE MINNESOTA SOLAR ENERGY INDUSTRIES ASSOCIATION

I. INTRODUCTORY REMARKS

The Minnesota Solar Energy Industries Association (MnSEIA) appreciates the Minnesota Public Utilities Commission's (PUC or the "Commission") interest in addressing the apparent volatility in the avoided distribution capacity cost component in the Value of Solar (VOS) methodology and for the opportunity to advocate for a more accurate value to compensate Community Solar Garden (CSG) Developers. This volatility is the result of the use of peak load growth over the last ten years in the denominator of the calculation of the avoided distribution capacity cost, and we believe that this volatility likely indicates that this VOS value needs refinement.

Among other things we will discuss later, peak loads will fluctuate from year to year due to factors such as weather and the economy that are independent of underlying load growth. These fluctuations are not necessarily removed when loads are weather-normalized. This does not necessarily represent a disagreement with real-world valuation, but if there are other ways to get at that same valuation that is less volatile, MnSEIA believes pursuing that alternative valuation is a worthwhile endeavor.

<u>MnSEIA is, however, concerned that Xcel Energy's (Xcel) distribution capacity</u> <u>component alternative methodology does not yield accurate results that are fair and reasonable</u>. As such, in these comments MnSEIA will highlight the challenges with Xcel's distribution capacity component methodology and lay the groundwork for an alternative methodology that we intend to propose in the reply comment period.

Prior to being able to provide an alternative methodology, the industry is still analyzing some information requests received from the utility and we are awaiting the unveiling of the 2020 VOS methodology, which should be July 31, 2019. We hope to have an approach that can be integrated into an easy-to-read decision option.

II. BACKGROUND

A. Timeline of Material Matters

On September 6, 2016, the Minnesota Public Utilities Commission Ordered Xcel to do the following:

The Commission will also require Xcel, beginning with the 2018 value-of-solar rate, to use location-specific avoided costs in calculating avoided distribution capacity. Part of the benefit of distributed generation derives from its location on the grid; by being located near load, it reduces local peak demand and defers the need for distribution-system upgrades. The approved methodology allows a utility to calculate its value-of-solar rate using either location-specific or system-wide avoided distribution-capacity costs. In its filings to date, Xcel has used system-wide avoided distribution-capacity costs to calculate the value-of-solar rate. To fully reflect the value of distributed solar generation, however, Xcel will be required to begin including location-specific avoided costs in its 2018 value-of-solar calculations.¹

On March 26, 2018, the Commission approved Xcel's 2018 System-wide-value-of-solar tariff rate with modifications. In so doing, the Commission opted to not adopt Xcel's 2018 locational specific plan, stating:

The Commission accepts the Department's offer to convene a stakeholder process to review the calculation of locational avoided distribution costs in calculating the VOS rate. The Department will submit a progress report and any recommendations for methodology changes by December 31, 2018. The requirement that Xcel use locational specific avoided costs in calculation of avoided distribution capacity is suspended pending Commission approval of recommendations by the Department.²

¹ ORDER – APROVING VALUE-OF-SOLAR RATE FOR XCELS SOLAR GARDEN PROGRAM, CLARIFYING PROGRAM PARAMETERES, AND REQUIREMENT FURTEHR FILINGS, MINNESOTA PUBLIC UTILITIES COMMISSION, Docket No. E-002/M-13-867, Doc. Id. 20169-124627-01 at 14 (Sept. 6, 2016).

² ORDER APPROVING XCELS UPDATE TO THE 2018 SYSTEM-WIDE VALUE-OF-

During the November 14, 2018 SR*C Working Group Meeting, Xcel outlined its proposed solution to the volatility in the VOS's Distribution Capacity Component.³

In November of 2018, Xcel, the Minnesota Department of Commerce (DOC or the "Department"), MnSEIA and developers were invited to the Department for a meeting about Xcel's distribution capacity component. In that meeting the industry outlined challenges it had with the methodology, which included among other things, a lack of compensation for future planned distribution upgrades and a general reliance on past data to compute future distribution needs.

On November 27, 2018, MnSEIA rearticulated in writing its verbal position from the prior meeting. In its commentary, MnSEIA stated the following:

Concurrent with the Commission's consideration of the 2019 VOS is a conversation around the avoided distribution capacity value component and locational value for future gardens. The current 2019 VOS has an effective distribution capacity value of \$0. This is a big part of the reason the 2019 VOS dropped 13% in a single year. And it is a strange result, given that Xcel itself has spent \$199 million on capacity-related upgrades to its Minnesota distribution system over the past ten years.8 (In other words, Xcel averages almost \$20 million per year on capacity related distribution upgrades, but is awarding zero avoided costs savings to 2019-vintage VOS projects.). At the same time, the VOS methodology gives zero value to the \$42 million in distribution upgrades that CSG Developers have purchased for the utility (through June 2018), and zero value to the \$8.2 million in distribution engineering studies that CSG developers have paid to date – despite the value that both will provide to the distribution system over the next 25 years.⁴

On March 22, 2019, the Commission ordered that "The Minnesota Department of Commerce and Xcel shall solicit the opinions of the stakeholders regarding Xcel's proposed

SOLAR TARIFF RATE WITH MODIFICATIONS, MINNESOTA PUBLIC UTILITIES COMMISSION, Docket No. E-002/M-13-867, Doc. Id. 20189-141380-01 at 8-9 (Mar. 26, 2018).

³ COMPLIANCE FILING – STAKEHOLDER MEETING MINUES, XCEL ENERGY, Docket No. E-002/M-13-867, Doc. Id. 20192-150377-01 at Document B (Feb. 19, 2019).

⁴ COMMENTS – PART 1 OF 2, MINNESOTA SOLAR ENERGY INDUSTRIES ASSOCIATION, Docket No. E-002/M-13-867, Doc. Id. 201811-148051-01 at 4 (Nov. 27, 2018).

alternative method for calculating the VOS's avoided distribution cost, and Xcel shall file a more fully developed proposal no later than May 1, 2019."⁵

On April 9, 2019, Xcel requested that the Solar*Rewards Community (S*RC) Stakeholders weigh in with their thoughts on Xcel's proposed methodology for determining a distribution capacity component.⁶

On April 16, 2019, MnSEIA submitted informal commentary to Xcel. The informal comments articulated the same positions that MnSEIA had previously stated verbally in the November meeting and in MnSEIA's written November 27, 2018 comments. MnSEIA, however, refrained from adding anything additional to the discussion because 1) the legislature at that time was seriously evaluating significant changes to the Community Solar Garden program; 2) Xcel Energy refused to provide estimated distribution capacity component values for the 2020 Value of Solar, despite several companies requesting this; and 3) "our initial challenges with Xcel's methodology were not further considered, we intend[ed] to share those [other challenges] only during a formal PUC comment period."⁷

On May 1, 2019, Xcel filed its Compliance Filing for the Community Solar Gardens Program. This document contained Xcel's methodology and statements of reasonableness for it. It also contained stakeholder outreach and feedback.⁸

On June 6, 2019, MnSEIA requested an extension in part to retain an expert witness to help develop a potential third option for the distribution capacity component.⁹

On June 7, 2019, the Commission granted MnSEIA's extension.¹⁰

- ⁶ COMPLIANCE FILING COMMUNITY SOLAR GARDENS PROGRAM, XCEL ENERGY, Docket No. E-002/M-13-867, Doc. Id. 20195-152611-01 at 7 (May 1, 2019).
- ⁷ *Id.* at 6-10.
- ⁸ *Id.* at ATTACHMENT C.
- ⁹ EXTENSIONVARIANCE REQUEST, MINNESOTA SOLAR ENERGY INDUSTRIES ASSOCIATION, Docket No. E-002/M-13-867, Doc. Id. 20196-153411-01 (Jun. 6, 2019).
- ¹⁰ NOTICE OF EXTENSIONVARIANCE, MINNESOTA PUBLIC UTILITIES COMMISSION, Docket No. E-002/M-13-867, Doc. Id. 20196-153433-01 (Jun. 7, 2019).

⁵ ORDER – APPROVING XCEL UPDATE TO THE 2019 SYSTEM WIDE VALUE OF SOLAR TARIFF RATE WITH MODIFICATIONS, Docket No. E-002/M-13-867, Doc. Id. 20193-151281-01 at 14 (Mar. 22, 2019).

On July 1, 2019, MnSEIA retained Tom Beach of Crossborder Energy. Tom's CV will be filed alongside these comments.

B. Overview of Xcel Energy's Distribution Capacity Component Recommendation

Xcel proposes a new methodology that makes three significant changes to the calculation of avoided distribution capacity costs. First, instead of using ten years of historical capacity-related distribution project costs in the numerator, the new method would use capacity-related distribution investments over three recent historical years and two forecast years. Second, the new approach would use in the denominator the distribution system capacity added by these five years of projects. Third, Xcel discounts the resulting \$ per kW avoided distribution capacity cost by an arbitrary 50%.

Xcel's discussion of its method also makes clear that it excludes from the list of capacityrelated distribution projects those that are related to:

- Asset health,
- Equipment failure,
- Large customer requirements,
- Transmission requirements, and
- Reliability requirements.

III. COMMENTARY

A. Expert Witness

MnSEIA is pleased to have retained Tom Beach of Crossborder Energy to help facilitate the development of a new distribution capacity component. Among many other things, Tom worked on a very similar docket in Colorado. Tom will be able to weigh in through our initial comments, reply comments and attend the hearing in person for Commissioner questioning, if need be.

MnSEIA did, however, try to solicit bids from other experts. Most notably was Clean Power Research (CPR), who originally drafted the VOS Methodology. CPR is the expert organization that previously worked on this issue and when contacted about participating in the docket they noted interested in continuing their previous work for the state agencies that had previously engaged them on the VOS methodology. This would help develop a third approach to the distribution capacity component. MnSEIA suggests that the Commission and the Department consider retaining their own expert, CPR for instance, to help develop a third approach to this distribution capacity component process.

There does not appear to be any immediacy in altering this VOS variable, but there is great benefit in ultimately devising a scientifically sound rate. So we suggest the Commission and the Department explore this option, if possible.

B. While The Distribution Capacity Component Should Be Modified To Reduce Volatility, Xcel's Proposal Does Not Capture the Full Value Provided, and Should Subsequently Be Improved Upon By 1) Adding A Longer Data Period; 2) Removing The Arbitrary 50% Discount Factor; 3) Including A Broader Set Of Distribution Projects; 4) Include More "Capacity Related Projects" In The Methodology; And 5) Include Avoided Investments In Distribution Plant.

In general, MnSEIA's commentary today seeks to highlight the practical challenges with Xcel's alternative distribution capacity component. However, as mentioned in our introductory remarks, MnSEIA supports the use of the added distribution system capacity in the denominator of the calculation. One of the issues we do hope this Commission proceeding can solve is to reduce the volatility associated with the current methodology, if an appropriate alternative is available.

When peak load growth over the period used in the analysis is low, the result can be a very high avoided distribution capacity cost component. Conversely, when peak load growth is artificially high, the result can be too-low avoided distribution capacity costs. There is also the issue of how to deal with negative load growth (i.e. declining peak demand) over the period, in which case under the current methodology the avoided distribution capacity cost is assumed to be zero. Adding the distribution system capacity in the denominator of the calculation should address the issue of fluctuations in peak demand causing year-to-year volatility in the avoided distribution capacity cost component. When the utility makes capacity-related investments to its distribution system, by definition it will increase the capacity of the system. Consequently, MnSEIA does support Xcel's utilization of distribution system capacity as the denominator of the calculation.

Nevertheless, MnSEIA has several critiques of Xcel's alternative methodology, because Xcel's alternative approach pulls the distribution capacity component further away from a truly scientific valuation. First, as we have stated in this docket already and in conversations with Xcel, MnSEIA recommends exploring the use of more than five years of data, in order to better capture long-run avoided distribution capacity costs. Distributed solar generation will have an economic life of at least 25 years, and if a new solar installation does not defer a distribution investment immediately, it may contribute to doing so at some other point in its 25-year life. Five years of data is one-fifth of a community solar garden contract life, and it does not appropriately value distribution upgrades that may appear in future years. The five year period is arbitrary. And it generally has the effect of devaluing the actual solar benefits associated with this credit. This is contrary to the VOS's intent of trying to derive the true value of distributed solar.

As such MnSEIA has asked Xcel for more years of the data that the utility uses in its proposed methodology, to explore developing a longer-term calculation. We are currently analyzing the responses from Xcel and hope to integrate these information request answers into our reply commentary. For now we will state that 1) we believe more than 5 years of data is

necessary to create a useful distribution capacity component value; and 2) there are widely-used methods for calculating marginal or avoided distribution capacity costs using more than five years of data. For example, the National Economic Research Associates (NERA) regression method is used by many utilities to determine their long-run marginal or avoided distribution capacity costs. The NERA regression model fits incremental distribution investment costs to changes in distribution system capacity, using at least 15 years of data to capture the utility's long-term marginal costs for capacity. The slope of the resulting regression line provides an estimate of the marginal cost of distribution investments associated with changes in peak demand. The NERA methodology typically uses ten years of historical expenditures on distribution investments (for example, as reported in FERC Form 1), and a five-year forecast of future expenditures and expected increases in distribution capacity. The NERA method has the benefit of providing a means (the regression) to separate investments that impact capacity from those that do not; thus, one does not need to make the difficult determination of which projects are capacity-related and deferrable by distributed generation (which we discuss further below).

Second, MnSEIA strongly opposes Xcel's arbitrary 50% discount factor, and suggests its removal from any distribution capacity component methodology. Per Xcel, this discount factor is supposed to reflect solar not being deployed in the right places or in the right amounts to avoid distribution capacity costs. With respect to these arguments, it is important to note again that Xcel's proposed calculation is based <u>on just five years of data</u>, whereas distributed solar will have an economic life of 25 years or more. Although a solar installation may be located in a distribution planning area with zero avoided distribution costs this year (using Xcel's five-year analysis), those avoided costs may increase significantly in future years. This changing location of avoided distribution costs over time can be seen from Xcel's own summary of the results of its proposed method by planning area over time from 2015 through 2019, from Attachment A, page 1 of 3 of its filing, which we have reposted below:

Distribution Ca	pacity Value	- Cents	per kWh
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VOS Vintage	Current Method: Peak Growth Based					Alternative Method: Cost Based				
	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019
System Cost per kWh	2.28	0.00	0.00	0.82	0.00	0.23	0.21	0.25	0.17	0.34
Planning Area Cost per kWh										
Minneapolis				0.69	0.00	0.00	0.30	0.00	0.00	0.00
Minnetonka				0.63	27.72	0.24	0.24	0.26	0.11	0.16
Edina				0.53	0.00	0.00	0.00	0.11	0.16	0.15
South East				0.24	0.72	0.21	0.20	0.20	0.13	0.38
Maple Grove				0.32	0.93	0.85	0.06	0.14	0.13	0.00
Newport				0.16	0.39	0.21	0.03	0.00	0.17	0.72
St. Paul				0.06	0.32	0.05	0.00	0.00	0.00	0.00
North West				0.33	0.71	0.13	0.23	0.30	0.23	0.33
White Bear Lake				0.27	0.95	0.24	0.53	0.24	0.22	0.32

11

¹¹ In this table a planning area may have zero avoided distribution costs in one year, but

As the graph illustrates, there can be large spikes in distribution capacity value from one year to the next. Take the Newport planning area for instance, where the component goes from 0 cents in 2017 to .72 cents in 2019. This rapid rise, even in an alternative designed to reduce volatility, illustrates that there is still a significant amount of price fluctuation from year to year. This fluctuation can be eased with a 25-year look forward, which would likely show the need for distribution capacity at some point throughout Xcel's service territory. This would thus lessen a need for a discount factor based on sub-optimal deployment. In short, the argument for a discount factor appears to be predicated on Xcel's desire to mitigate a problem caused by their own arbitrary desire to use a smaller 5-year sample size.

Furthermore, the converse of Xcel's argument is also true – a solar project will be underpaid if it is located in an area whose avoided distribution capacity costs this year are above the system average on which this VOS component is based. Similar long-term considerations apply with respect to the amount of solar installed. Although the right amount of solar may not materialize this year to displace a near-term distribution upgrade, over time the amount of distributed solar in that area can grow large enough to defer the next addition that is not within today's planning horizon. In sum, the long economic life of solar projects argues for paying the full system-wide avoided distribution capacity cost, without an arbitrary 50% discount.

Third, MnSEIA is concerned with the exclusion of certain categories of distribution projects from Xcel's calculations. For example, "Reliability" projects may be installed principally to deal with threats to reliability, such as certain contingencies on the distribution system; however, these threats may be associated with high-load conditions (which solar can mitigate), and such projects can have a secondary benefit of increasing system capacity. We think that many of these projects should be classified as capacity-related and deferrable by distributed resources. MnSEIA has asked Xcel for cost data on these other categories of distribution projects and we hope to opine more on this matter in Reply Comments.

Fourth, even projects that replace existing infrastructure that fails or reaches the end of its life should be considered to be "capacity-related," because they keep system capacity from declining. In addition, larger solar projects can pay significant amounts for upgrades to the Xcel distribution system that may have secondary benefits of expanding three-phase service, freeing up distribution capacity for additional load growth, and replacing equipment that the utility would have to already replace over the next 25 years. Even if these considerations are not included in the calculations, at a minimum they also argue in favor of <u>not</u> adopting Xcel's arbitrary 50% discount factor.

Fifth, avoided investments in distribution plant are accompanied by lower spending over time on distribution O&M and by reduced common plant. These additional avoided costs can be

then will have a positive value in a subsequent year. *Id.* at ATTACHMENT A (see the section titled "Alternative Method: Cost-Based").

calculated from FERC Form 1 data and added to distribution capacity costs. We have calculated from recent FERC Form 1 data that Xcel's distribution O&M costs are \$17.40 per kW and its general plant in service was 3.3% of total plant in service as of the end of 2018.¹² Thus, if Xcel's 2019 avoided investment-related distribution capacity costs are \$160 per kW (without the 50% discount), these should be increased by a factor of 1.033 to account for common plant and by \$17.40 per kW for avoided O&M. The resulting 2019 avoided distribution capacity costs are \$183 per kW (i.e. \$160 x 1.033 + \$17.40).

The above challenges with Xcel's distribution capacity component illustrate that the utility's approach is a flawed attempt at mitigating the volatility of the current VOS distribution capacity component methodology. The industry does generally support a transition away from a volatile component for a more stable approach that would promote to better business development, but as illustrated above, Xcel's alternative methodology <u>unduly and</u> <u>unscientifically</u> reduces the value of the component.

Xcel's methodology, with its reduced timelines, arbitrary 50% discount factor, small subset of distribution projects, and lack of avoided investments in distribution plant, is ultimately a methodology we could not support in favor of the current VOS methodology even with its year-to-year volatility. Simply put, we believe the current methodology even with its several years of \$0 valuations is a more accurate predictor of this VOS component than Xcel's new alternative proposal, unless our recommended alterations are made.

C. Xcel's May 1, 2019 Categorization of MnSEIA's Informal Comments is Misleading.

MnSEIA is disappointed with the way that Xcel articulated its commentary in its May 1, 2019 compliance filing with the Commission, and we write today to better align the record with our perspective on the proceedings thus far. Despite receiving our commentary that includes rationales for why their methodology is incorrect, Xcel stated that "Parties provided virtually no substantive feedback on the Company's proposed alternate methodology." This is not true. This is evidence by Xcel's Attachment C that they included at the end of with this compliance filing. Xcel received feedback from 5 parties, including Novel Energy Solutions, SunShare, Stoel Rives, Fresh Energy and MnSEIA.

In our informal comments we did decline to provide new arguments for why the methodology is flawed for a number of reasons, including a desire to have the 2020 VOS Value before making any decision on the matter. But more importantly we did not provide additional insight into Xcel's methodology, because Xcel has repeatedly failed to consider the *initial* concerns that MnSEIA provided to them earlier in the process. Their disregard for our substantive recommendations through this filing amounts to ignoring our initial concerns for the

Ratios of NSP Minnesota's distribution O&M expenses and annual peak loads average \$17 per kW for the years 2016 to 2018. The 3.3% general plant "loader" is based on general and total plant in service by the end of 2018.

third time in this process (first in the November 2018 meeting, second after our commentary was published in November and now this filing in response to our informal comments).

In our informal comments we stated the following:

At the November stakeholder meeting where MnSEIA, other developer members, Xcel and the Department of Commerce met to discuss how to improve Xcel's distribution capacity component. At that time, Xcel was proposing a 5-year look forward approach to calculating the distribution capacity component as opposed to a partial look forward and look back, as it is doing today. MnSEIA and our members argued **that a 25-year look forward makes significantly more sense**, as the VOS is used for 25 year contracts. We argued this same point in relation to the current methodology in our November commentary. If Xcel intends to upgrade its distribution system and the addition of a new CSG might delay that upgrade during the CSG's life-span, a garden that is online during the time should receive credit for the cost deferral.

MnSEIA and our members further argued that **some valuation should be placed on the upgrade costs that developers are paying to improve Xcel's substations and equipment**. The counter argument, which we've heard in this meeting and elsewhere, is that the upgrades are only needed because a CSG is being added to the grid. The crux of the argument is that the upgrades would otherwise not be made. Certainly this is true at times - but it is not true in all cases. Take for instance when Xcel will have to upgrade an old transformer that is close to where the CSG is to be added. If the developer were to add a new transformer to interconnect their garden, then Xcel would save money on a piece of equipment it knows it will need to upgrade shortly. This is a clear cost savings for the utility and its ratepayers, but it is not included in the current VOS methodology nor is it included in the proposed methodology. Presumably upgrades like this have occurred somewhat frequently with over 500MW of interconnected gardens.

We do have additional challenges with Xcel's distribution capacity component, but because our initial challenges with Xcel's methodology were not further considered, we intend to share those only during a formal PUC comment period.¹³

Now that we have retained Tom Beach, we look to further expound on the above, but we write this here to illustrate that Xcel's statements about stakeholder feedback are misleading and that this process has been unusually frustrating, given all the good work that has transpired between the developer community and Xcel since the SR*C Working Group was established.

¹³ COMPLIANCE FILING – COMMUNITY SOLAR GARDENS PROGRAM, XCEL ENERGY, Docket No. E-002/M-13-867, Doc. Id. 20195-152611-01 at ATTACHMENT C (May 1, 2019) [Emphasis added].

Xcel's May 1, 2019 filing sought to unfairly cast the industry as nonparticipants in this process. But in so doing, the utility provided more evidence that they have not been listening to the developer community on this issue and have instead chosen to unnecessarily escalate this issue by elevating this to the Commission instead of working it out through mutual development or further negotiations.

But despite the challenges, as this process continues, we hope to return to a more collaborative process and work again with the utility to potentially develop a compromise methodology that all stakeholders can agree upon. We believe with our expert in place we can also provide greater insight into the development of this component and we hope Xcel engages with us to utilize his work in other states on similar matters.

D. Conclusory Remarks

As we recently received Xcel Energy's responses to our information requests and the Xcel meeting that will unveil the 2020 VOS rate is July 31, 2019, MnSEIA intends to file an alternative approach to Xcel's Distribution Capacity Component in our Reply Comments. We hope to provide a third approach for the Commission to consider, or at the very least, a clearer subset of improvements for Xcel's methodology.

We understand that providing new content in reply can be challenging for other stakeholders at times. So we are providing this statement to put the Commission and the utility on notice of our intention in the event that either entity seeks to add an additional comment period for further review of our alternative. In the absence of the 2020 VOS, proposing an alternative methodology is not practicable at this time, but should be shortly.

Thank you for your consideration of our comments.

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Tom Beach Principal Consultant Crossborder Energy tomb@crossborderenergy.com Mr. Beach is principal consultant with the consulting firm Crossborder Energy. Crossborder Energy provides economic consulting services and strategic advice on market and regulatory issues concerning the natural gas and electric industries. The firm is based in Berkeley, California, and its practice focuses on the energy markets in California, the U.S., and Canada.

Since 1989, Mr. Beach has had an active consulting practice on policy, economic, and ratemaking issues concerning renewable energy development, the restructuring of the gas and electric industries, the addition of new natural gas pipeline and storage capacity, and a wide range of issues concerning independent power generation. From 1981 through 1989 he served at the California Public Utilities Commission, including five years as an advisor to three CPUC commissioners. While at the CPUC, he was a key advisor on the **Q**UC's restructuring of the natural gas industry in California, and worked extensively on the state's implementation of the Public Utilities Regulatory Policies Act of 1978.

AREAS OF EXPERTISE

- Renewable Energy Issues: extensive experience assisting clients with issues concerning Renewable Portfolio Standard programs, including program structure and rate impacts. He has also worked for the solar industry on rate design and net energy metering issues, on the creation of the California Solar Initiative, as well as on a wide range of solar issues in many other states.
- Restructuring the Natural Gas and Electric Industries: consulting and expert testimony on numerous issues involving the restructuring of the electric industry, including the 2000 -2001 Western energy crisis.
- Energy Markets: studies and consultation on the dynamics of natural gas and electric markets, including the impacts of new pipeline capacity on natural gas prices and of electric restructuring on wholesale electric prices.
- Qualifying Facility Issues: consulting with QF clients on a broad range of issues involving independent power facilities in the Western U.S. He is one of the leading experts in California on the calculation of avoided cost prices. Other QF issues on which he has worked include complex QF contract restructurings, standby rates, greenhouse gas emission regulations, and natural gas rates for cogenerators. Crossborder Energy's QF clients include the full range of QF technologies, both fossil-fueled and renewable.
- Pricing Policy in Regulated Industries: consulting and expert testimony on natural gas pipeline rates and on marginal cost-based rates for natural gas and electric utilities.

EDUCATION

Mr. Beach holds a B.A. in English and physics from Dartmouth College, and an M.E. in mechanical engineering from the University of California at Berkeley.

ACADEMIC HONORS

Graduated from Dartmouth with high honors in physics and honors in English. Chevron Fellowship, U.C. Berkeley, 1978-79

PROFESSIONAL ACCREDITATION

Registered professional engineer in the state of California.

EXPERT WITNESS TESTIMONY BEFORE THE CALIFORNIA PUBLIC UTILITIES COMMISSION

- 1. Prepared Direct Testimony on Behalf of **Pacific Gas & Electric Company/Pacific Gas Transmission** (I. 88-12-027 — July 15, 1989)
 - Competitive and environmental benefits of new natural gas pipeline capacity to California.
- 2. a. Prepared Direct Testimony on Behalf of the **Canadian Producer Group** (A. 89-08-024 November 10, 1989)
 - b. Prepared Rebuttal Testimony on Behalf of the **Canadian Producer Group** (A. 89-08-024 November 30, 1989)
 - *Natural gas procurement policy; gas cost forecasting.*
- 3. Prepared Direct Testimony on Behalf of the **Canadian Producer Group** (R. 88-08-018 December 7, 1989)
 - Brokering of interstate pipeline capacity.
- 4. Prepared Direct Testimony on Behalf of the **Canadian Producer Group** (A. 90-08-029 November 1, 1990)
 - *Natural gas procurement policy; gas cost forecasting; brokerage fees.*
- 5. Prepared Direct Testimony on Behalf of the Alberta Petroleum Marketing Commission and the Canadian Producer Group (I. 86-06-005 — December 21, 1990)
 - *Firm and interruptible rates for noncore natural gas users*

- 6. a. Prepared Direct Testimony on Behalf of the Alberta Petroleum Marketing Commission (R. 88-08-018 — January 25, 1991)
 - b. Prepared Responsive Testimony on Behalf of the Alberta Petroleum Marketing Commission (R. 88-08-018 — March 29, 1991)
 - Brokering of interstate pipeline capacity; intrastate transportation policies.
- 7. Prepared Direct Testimony on Behalf of the **Canadian Producer Group** (A. 90-08-029/Phase II April 17, 1991)
 - Natural gas brokerage and transport fees.
- Prepared Direct Testimony on Behalf of LUZ Partnership Management (A. 91-01-027 — July 15, 1991)
 - Natural gas parity rates for cogenerators and solar thermal power plants.
- 9. Prepared Joint Testimony of R. Thomas Beach and Dr. Robert B. Weisenmiller on Behalf of the **California Cogeneration Council** (I. 89-07-004 July 15, 1991)
 - Avoided cost pricing; use of published natural gas price indices to set avoided cost prices for qualifying facilities.
- 10. a. Prepared Direct Testimony on Behalf of the **Indicated Expansion Shippers** (A. 89-04-033 October 28, 1991)
 - b. Prepared Rebuttal Testimony on Behalf of the **Indicated Expansion Shippers** (A. 89-04-0033 November 26,1991)
 - *Natural gas pipeline rate design; cost/benefit analysis of rolled-in rates.*
- 11. Prepared Direct Testimony on Behalf of the **Independent Petroleum Association of Canada** (A. 91-04-003 — January 17, 1992)
 - Natural gas procurement policy; prudence of past gas purchases.
- 12. a. Prepared Direct Testimony on Behalf of the **California Cogeneration Council** (I.86-06-005/Phase II June 18, 1992)
 - b. Prepared Rebuttal Testimony on Behalf of the **California Cogeneration Council** (I. 86-06-005/Phase II July 2, 1992)
 - Long-Run Marginal Cost (LRMC) rate design for natural gas utilities.
- 13. Prepared Direct Testimony on Behalf of the **California Cogeneration Council** (A. 92-10-017 February 19, 1993)
 - *Performance-based ratemaking for electric utilities.*

- 14. Prepared Direct Testimony on Behalf of the SEGS Projects (C. 93-02-014/A. 93-03-053 — May 21, 1993)
 - Natural gas transportation service for wholesale customers.
- 15 a. Prepared Direct Testimony on Behalf of the **Canadian Association of Petroleum Producers** (A. 92-12-043/A. 93-03-038 — June 28, 1993)
 - b. Prepared Rebuttal Testimony of Behalf of the **Canadian Association of Petroleum Producers** (A. 92-12-043/A. 93-03-038 — July 8, 1993)
 - Natural gas pipeline rate design issues.
- 16. a. Prepared Direct Testimony on Behalf of the **SEGS Projects** (C. 93-05-023 November 10, 1993)
 - b. Prepared Rebuttal Testimony on Behalf of the **SEGS Projects** (C. 93-05-023 January 10, 1994)
 - Utility overcharges for natural gas service; cogeneration parity issues.
- 17. Prepared Direct Testimony on Behalf of the **City of Vernon** (A. 93-09-006/A. 93-08-022/A. 93-09-048 June 17, 1994)
 - Natural gas rate design for wholesale customers; retail competition issues.
- 18. Prepared Direct Testimony of R. Thomas Beach on Behalf of the **SEGS Projects** (A. 94-01-021 August 5, 1994)
 - Natural gas rate design issues; rate parity for solar thermal power plants.
- 19. Prepared Direct Testimony on Transition Cost Issues on Behalf of **Watson Cogeneration Company** (R. 94-04-031/I. 94-04-032 — December 5, 1994)
 - Policy issues concerning the calculation, allocation, and recovery of transition costs associated with electric industry restructuring.
- 20. Prepared Direct Testimony on Nuclear Cost Recovery Issues on Behalf of the **California Cogeneration Council** (A. 93-12-025/I. 94-02-002 — February 14, 1995)
 - *Recovery of above-market nuclear plant costs under electric restructuring.*
- 21. Prepared Direct Testimony on Behalf of the **Sacramento Municipal Utility District** (A. 94-11-015 June 16, 1995)
 - *Natural gas rate design; unbundled mainline transportation rates.*

- 22. Prepared Direct Testimony on Behalf of **Watson Cogeneration Company** (A. 95-05-049 — September 11, 1995)
 - Incremental Energy Rates; air quality compliance costs.
- 23. a. Prepared Direct Testimony on Behalf of the **Canadian Association of Petroleum Producers** (A. 92-12-043/A. 93-03-038/A. 94-05-035/A. 94-06-034/A. 94-09-056/A. 94-06-044 — January 30, 1996)
 - b. Prepared Rebuttal Testimony on Behalf of the **Canadian Association of Petroleum Producers** (A. 92-12-043/A. 93-03-038/A. 94-05-035/A. 94-06-034/A. 94-09-056/A. 94-06-044 — February 28, 1996)
 - *Natural gas market dynamics; gas pipeline rate design.*
- 24. Prepared Direct Testimony on Behalf of the **California Cogeneration Council and Watson Cogeneration Company** (A. 96-03-031 — July 12, 1996)
 - *Natural gas rate design: parity rates for cogenerators.*
- 25. Prepared Direct Testimony on Behalf of the **City of Vernon** (A. 96-10-038 August 6, 1997)
 - Impacts of a major utility merger on competition in natural gas and electric markets.
- 26. a. Prepared Direct Testimony on Behalf of the **Electricity Generation Coalition** (A. 97-03-002 — December 18, 1997)
 - b. Prepared Rebuttal Testimony on Behalf of the **Electricity Generation Coalition** (A. 97-03-002 — January 9, 1998)
 - *Natural gas rate design for gas-fired electric generators.*
- 27. Prepared Direct Testimony on Behalf of the **City of Vernon** (A. 97-03-015 January 16, 1998)
 - Natural gas service to Baja, California, Mexico.

- 28. a. Prepared Direct Testimony on Behalf of the **California Cogeneration Council** and Watson Cogeneration Company (A. 98-10-012/A. 98-10-031/A. 98-07-005 — March 4, 1999).
 - b. Prepared Direct Testimony on Behalf of the **California Cogeneration Council** (A. 98-10-012/A. 98-01-031/A. 98-07-005 March 15, 1999).
 - c. Prepared Direct Testimony on Behalf of the **California Cogeneration Council** (A. 98-10-012/A. 98-01-031/A. 98-07-005 June 25, 1999).
 - Natural gas cost allocation and rate design for gas-fired electric generators.
- 29. a. Prepared Direct Testimony on Behalf of the **California Cogeneration Council** and Watson Cogeneration Company (R. 99-11-022 — February 11, 2000).
 - b. Prepared Rebuttal Testimony on Behalf of the **California Cogeneration Council** and Watson Cogeneration Company (R. 99-11-022 — March 6, 2000).
 - c. Prepared Direct Testimony on Line Loss Issues of behalf of the **California Cogeneration Council** (R. 99-11-022 — April 28, 2000).
 - d. Supplemental Direct Testimony in Response to ALJ Cooke's Request on behalf of the **California Cogeneration Council and Watson Cogeneration Company** (R. 99-11-022 April 28, 2000).
 - e. Prepared Rebuttal Testimony on Line Loss Issues on behalf of the **California Cogeneration Council** (R. 99-11-022 — May 8, 2000).
 - *Market-based, avoided cost pricing for the electric output of gas-fired cogeneration facilities in the California market; electric line losses.*
- 30. a. Direct Testimony on behalf of the **Indicated Electric Generators** in Support of the Comprehensive Gas OII Settlement Agreement for Southern California Gas Company and San Diego Gas & Electric Company (I. 99-07-003 May 5, 2000).
 - b. Rebuttal Testimony in Support of the Comprehensive Settlement Agreement on behalf of the **Indicated Electric Generators** (I. 99-07-003 May 19, 2000).
 - Testimony in support of a comprehensive restructuring of natural gas rates and services on the Southern California Gas Company system. Natural gas cost allocation and rate design for gas-fired electric generators.
- 31. a. Prepared Direct Testimony on the Cogeneration Gas Allowance on behalf of the **California Cogeneration Council** (A. 00-04-002 September 1, 2000).
 - b. Prepared Direct Testimony on behalf of **Southern Energy California** (A. 00-04-002 September 1, 2000).
 - Natural gas cost allocation and rate design for gas-fired electric generators.

- 32. a. Prepared Direct Testimony on behalf of **Watson Cogeneration Company** (A. 00-06-032 September 18, 2000).
 - b. Prepared Rebuttal Testimony on behalf of **Watson Cogeneration Company** (A. 00-06-032 October 6, 2000).
 - *Rate design for a natural gas "peaking service."*
- 33. a. Prepared Direct Testimony on behalf of **PG&E National Energy Group & Calpine Corporation** (I. 00-11-002—April 25, 2001).
 - b. Prepared Rebuttal Testimony on behalf of **PG&E National Energy Group & Calpine Corporation** (I. 00-11-002—May 15, 2001).
 - Terms and conditions of natural gas service to electric generators; gas curtailment policies.
- 34. a. Prepared Direct Testimony on behalf of the **California Cogeneration Council** (R. 99-11-022—May 7, 2001).
 - b. Prepared Rebuttal Testimony on behalf of the **California Cogeneration Council** (R. 99-11-022—May 30, 2001).
 - Avoided cost pricing for alternative energy producers in California.
- 35. a. Prepared Direct Testimony of R. Thomas Beach in Support of the Application of **Wild Goose Storage Inc.** (A. 01-06-029—June 18, 2001).
 - b. Prepared Rebuttal Testimony of R. Thomas Beach on behalf of **Wild Goose Storage** (A. 01-06-029—November 2, 2001)
 - Consumer benefits from expanded natural gas storage capacity in California.
- 36. Prepared Direct Testimony on behalf of the **County of San Bernardino** (I. 01-06-047—December 14, 2001)
 - *Reasonableness review of a natural gas utility's procurement practices and storage operations.*
- 37. a. Prepared Direct Testimony on behalf of the **California Cogeneration Council** (R. 01-10-024—May 31, 2002)
 - b. Prepared Supplemental Testimony on behalf of the **California Cogeneration Council** (R. 01-10-024—May 31, 2002)
 - Electric procurement policies for California's electric utilities in the aftermath of the California energy crisis.

- 38. Prepared Direct Testimony on behalf of the **California Manufacturers & Technology** Association (R. 02-01-011—June 6, 2002)
 - "Exit fees" for direct access customers in California.
- 39. Prepared Direct Testimony on behalf of the **County of San Bernardino** (A. 02-02-012 August 5, 2002)
 - General rate case issues for a natural gas utility; reasonableness review of a natural gas utility's procurement practices.
- 40. Prepared Direct Testimony on behalf of the **California Manufacturers and Technology** Association (A. 98-07-003 — February 7, 2003)
 - *Recovery of past utility procurement costs from direct access customers.*
- 41. a. Prepared Direct Testimony on behalf of the **California Cogeneration Council**, the California Manufacturers & Technology Association, Calpine Corporation, and Mirant Americas, Inc. (A 01-10-011 — February 28, 2003)
 - b. Prepared Rebuttal Testimony on behalf of the **California Cogeneration Council**, the California Manufacturers & Technology Association, Calpine Corporation, and Mirant Americas, Inc. (A 01-10-011 — March 24, 2003)
 - Rate design issues for Pacific Gas & Electric's gas transmission system (Gas Accord II).
- 42. a. Prepared Direct Testimony on behalf of the California Manufacturers & Technology Association; Calpine Corporation; Duke Energy North America; Mirant Americas, Inc.; Watson Cogeneration Company; and West Coast Power, Inc. (R. 02-06-041 — March 21, 2003)
 - b. Prepared Rebuttal Testimony on behalf of the **California Manufacturers & Technology Association; Calpine Corporation; Duke Energy North America; Mirant Americas, Inc.; Watson Cogeneration Company; and West Coast Power, Inc.** (R. 02-06-041 — April 4, 2003)
 - Cost allocation of above-market interstate pipeline costs for the California natural gas utilities.
- 43. Prepared Direct Testimony of R. Thomas Beach and Nancy Rader on behalf of the **California Wind Energy Association** (R. 01-10-024 April 1, 2003)
 - Design and implementation of a Renewable Portfolio Standard in California.

- 44. a. Prepared Direct Testimony on behalf of the **California Cogeneration Council** (R. 01-10-024 June 23, 2003)
 - b. Prepared Supplemental Testimony on behalf of the **California Cogeneration Council** (R. 01-10-024 — June 29, 2003)
 - Power procurement policies for electric utilities in California.
- 45. Prepared Direct Testimony on behalf of the **Indicated Commercial Parties** (02-05-004 August 29, 2003)
 - Electric revenue allocation and rate design for commercial customers in southern California.
- 46. a. Prepared Direct Testimony on behalf of **Calpine Corporation and the California Cogeneration Council** (A. 04-03-021 — July 16, 2004)
 - b. Prepared Rebuttal Testimony on behalf of **Calpine Corporation and the California Cogeneration Council** (A. 04-03-021 — July 26, 2004)
 - Policy and rate design issues for Pacific Gas & Electric's gas transmission system (Gas Accord III).
- 47. Prepared Direct Testimony on behalf of the **California Cogeneration Council** (A. 04-04-003 August 6, 2004)
 - Policy and contract issues concerning cogeneration QFs in California.
- 48. a. Prepared Direct Testimony on behalf of the **California Cogeneration Council** and the California Manufacturers and Technology Association (A. 04-07-044 — January 11, 2005)
 - b. Prepared Rebuttal Testimony on behalf of the **California Cogeneration Council** and the California Manufacturers and Technology Association (A. 04-07-044 — January 28, 2005)
 - Natural gas cost allocation and rate design for large transportation customers in northern California.
- 49. a. Prepared Direct Testimony on behalf of the **California Manufacturers and Technology Association and the Indicated Commercial Parties** (A. 04-06-024 — March 7, 2005)
 - b. Prepared Rebuttal Testimony on behalf of the California Manufacturers and Technology Association and the Indicated Commercial Parties (A. 04-06-024 — April 26, 2005)
 - Electric marginal costs, revenue allocation, and rate design for commercial and industrial electric customers in northern California.

- 50. Prepared Direct Testimony on behalf of the **California Solar Energy Industries** Association (R. 04-03-017 — April 28, 2005)
 - Cost-effectiveness of the Million Solar Roofs Program.
- 51. Prepared Direct Testimony on behalf of **Watson Cogeneration Company, the Indicated Producers, and the California Manufacturing and Technology Association** (A. 04-12-004 — July 29, 2005)
 - *Natural gas rate design policy; integration of gas utility systems.*
- 52. a. Prepared Direct Testimony on behalf of the **California Cogeneration Council** (R. 04-04-003/R. 04-04-025 August 31, 2005)
 - b. Prepared Rebuttal Testimony on behalf of the **California Cogeneration Council** (R. 04-04-003/R. 04-04-025 October 28, 2005)
 - Avoided cost rates and contracting policies for QFs in California
- 53. a. Prepared Direct Testimony on behalf of the **California Manufacturers and Technology Association and the Indicated Commercial Parties** (A. 05-05-023 — January 20, 2006)
 - b. Prepared Rebuttal Testimony on behalf of the California Manufacturers and Technology Association and the Indicated Commercial Parties (A. 05-05-023 — February 24, 2006)
 - Electric marginal costs, revenue allocation, and rate design for commercial and industrial electric customers in southern California.
- 54. a. Prepared Direct Testimony on behalf of the **California Producers** (R. 04-08-018 January 30, 2006)
 - b. Prepared Rebuttal Testimony on behalf of the **California Producers** (R. 04-08-018 February 21, 2006)
 - Transportation and balancing issues concerning California gas production.
- 55. Prepared Direct Testimony on behalf of the **California Manufacturers and Technology** Association and the Indicated Commercial Parties (A. 06-03-005 — October 27, 2006)
 - Electric marginal costs, revenue allocation, and rate design for commercial and industrial electric customers in northern California.
- 56. Prepared Direct Testimony on behalf of the **California Cogeneration Council** (A. 05-12-030 March 29, 2006)
 - *Review and approval of a new contract with a gas-fired cogeneration project.*

- 57. a. Prepared Direct Testimony on behalf of **Watson Cogeneration, Indicated Producers, the California Cogeneration Council, and the California Manufacturers and Technology Association** (A. 04-12-004 — July 14, 2006)
 - b. Prepared Rebuttal Testimony on behalf of **Watson Cogeneration, Indicated Producers, the California Cogeneration Council, and the California Manufacturers and Technology Association** (A. 04-12-004 — July 31, 2006)
 - Restructuring of the natural gas system in southern California to include firm capacity rights; unbundling of natural gas services; risk/reward issues for natural gas utilities.
- 58. Prepared Direct Testimony on behalf of the **California Cogeneration Council** (R. 06-02-013 March 2, 2007)
 - Utility procurement policies concerning gas-fired cogeneration facilities.
- 59. a. Prepared Direct Testimony on behalf of the **Solar Alliance** (A. 07-01-047 August 10, 2007)
 - b. Prepared Rebuttal Testimony on behalf of the **Solar Alliance** (A. 07-01-047 September 24, 2007)
 - Electric rate design issues that impact customers installing solar photovoltaic systems.
- 60. a. Prepared Direct Testimony on Behalf of **Gas Transmission Northwest Corporation** (A. 07-12-021 — May 15, 2008)
 - b. Prepared Rebuttal Testimony on Behalf of Gas Transmission Northwest Corporation (A. 07-12-021 — June 13, 2008)
 - Utility subscription to new natural gas pipeline capacity serving California.
- 61. a. Prepared Direct Testimony on behalf of the **Solar Alliance** (A. 08-03-015 September 12, 2008)
 - b. Prepared Rebuttal Testimony on behalf of the **Solar Alliance** (A. 08-03-015 October 3, 2008)
 - Issues concerning the design of a utility-sponsored program to install 500 MW of utility- and independently-owned solar photovoltaic systems.

- 62. Prepared Direct Testimony on behalf of the **Solar Alliance** (A. 08-03-002 October 31, 2008)
 - Electric rate design issues that impact customers installing solar photovoltaic systems.
- 63. a. Phase II Direct Testimony on behalf of **Indicated Producers, the California Cogeneration Council, California Manufacturers and Technology Association, and Watson Cogeneration Company** (A. 08-02-001 — December 23, 2008)
 - b. Phase II Rebuttal Testimony on behalf of **Indicated Producers, the California Cogeneration Council, California Manufacturers and Technology Association, and Watson Cogeneration Company** (A. 08-02-001 — January 27, 2009)
 - Natural gas cost allocation and rate design issues for large customers.
- 64. a. Prepared Direct Testimony on behalf of the **California Cogeneration Council** (A. 09-05-026 November 4, 2009)
 - Natural gas cost allocation and rate design issues for large customers.
- 65. a. Prepared Direct Testimony on behalf of **Indicated Producers and Watson Cogeneration Company** (A. 10-03-028 — October 5, 2010)
 - b. Prepared Rebuttal Testimony on behalf of **Indicated Producers and Watson Cogeneration Company** (A. 10-03-028 — October 26, 2010)
 - *Revisions to a program of firm backbone capacity rights on natural gas pipelines.*
- 66. Prepared Direct Testimony on behalf of the **Solar Alliance** (A. 10-03-014 October 6, 2010)
 - Electric rate design issues that impact customers installing solar photovoltaic systems.
- 67. Prepared Rebuttal Testimony on behalf of the **Indicated Settling Parties** (A. 09-09-013 — October 11, 2010)
 - Testimony on proposed modifications to a broad-based settlement of rate-related issues on the Pacific Gas & Electric natural gas pipeline system.

- 68. a. Supplemental Prepared Direct Testimony on behalf of **Sacramento Natural Gas Storage, LLC** (A. 07-04-013 — December 6, 2010)
 - b. Supplemental Prepared Rebuttal Testimony on behalf of **Sacramento Natural Gas Storage, LLC** (A. 07-04-013 — December 13, 2010)
 - c. Supplemental Prepared Reply Testimony on behalf of **Sacramento Natural Gas Storage, LLC** (A. 07-04-013 — December 20, 2010)
 - Local reliability benefits of a new natural gas storage facility.
- 69. Prepared Direct Testimony on behalf of The Vote Solar Initiative (A. 10-11-015—June 1, 2011)
 - Distributed generation policies; utility distribution planning.
- 70. Prepared Reply Testimony on behalf of the Solar Alliance (A. 10-03-014—August 5, 2011)
 - Electric rate design for commercial & industrial solar customers.
- 71. Prepared Direct Testimony on behalf of the Solar Energy Industries Association (A. 11-06-007—February 6, 2012)
 - Electric rate design for solar customers; marginal costs.
- 72. a. Prepared Direct Testimony on behalf of the Northern California Indicated Producers (R.11-02-019—January 31, 2012)
 - b. Prepared Rebuttal Testimony on behalf of the Northern California Indicated Producers (R. 11-02-019—February 28, 2012)
 - Natural gas pipeline safety policies and costs
- 73. Prepared Direct Testimony on behalf of the Solar Energy Industries Association (A. 11-10-002—June 12, 2012)
 - Electric rate design for solar customers; marginal costs.
- 74. Prepared Direct Testimony on behalf of the Southern California Indicated Producers and Watson Cogeneration Company (A. 11-11-002—June 19, 2012)
 - Natural gas pipeline safety policies and costs

- 75. a. Testimony on behalf of the California Cogeneration Council (R. 12-03-014—June 25, 2012)
 - b. Repl y Testimony on behalf of the California Cogeneration Council (R. 12-03-014—July 23, 2012)
 - Ability of combined heat and power resources to serve local reliability needs in southern California.
- 76. a. Prepared Testimony on behalf of the Southern California Indicated Producers and Watson Cogeneration Company (A. 11-11-002, Phase 2—November 16, 2012)
 - b. Prepared Rebuttal Testimony on behalf of the Southern California Indicated Producers and Watson Cogeneration Company (A. 11-11-002, Phase 2—December 14, 2012)
 - Allocation and recovery of natural gas pipeline safety costs.
- 77. Prepared Direct Testimony on behalf of the Solar Energy Industries Association (A. 12-12-002—May 10, 2013)
 - Electric rate design for commercial & industrial solar customers; marginal costs.
- 78. Prepared Direct Testimony on behalf of the Solar Energy Industries Association (A. 13-04-012—December 13, 2013)
 - Electric rate design for commercial & industrial solar customers; marginal costs.
- 79. Prepared Direct Testimony on behalf of the Solar Energy Industries Association (A. 13-12-015—June 30, 2014)
 - Electric rate design for commercial & industrial solar customers; residential time-of-use rate design issues.

- 80. a. Prepared Direct Testimony on behalf of **Calpine Corporation** and the **Indicated Shippers** (A. 13-12-012—August 11, 2014)
 - b. Prepared Direct Testimony on behalf of Calpine Corporation, the Canadian Association of Petroleum Producers, Gas Transmission Northwest, and the City of Palo Alto (A. 13-12-012—August 11, 2014)
 - c. Prepared Rebuttal Testimony on behalf of **Calpine Corporation** (A. 13-12-012—September 15, 2014)
 - d. Prepared Rebuttal Testimony on behalf of Calpine Corporation, the Canadian Association of Petroleum Producers, Gas Transmission Northwest, and the City of Palo Alto (A. 13-12-012—September 15, 2014)
 - Rate design, cost allocation, and revenue requirement issues for the gas transmission system of a major natural gas utility.
- 81. Prepared Direct Testimony on behalf of the Solar Energy Industries Association (R. 12-06-013—September 15, 2014)
 - Comprehensive review of policies for rate design for residential electric customers in California.
- 82. Prepared Direct Testimony on behalf of the Solar Energy Industries Association (A. 14-06-014—March 13, 2015)
 - Electric rate design for commercial & industrial solar customers; marginal costs.
- 83. a. Prepared Direct Testimony on behalf of the Solar Energy Industries Association (A.14-11-014—May 1, 2015)
 - b. Prepared Rebuttal Testimony on behalf of the **Solar Energy Industries** Association (A. 14-11-014—May 26, 2015)
 - Time-of-use periods for residential TOU rates.
- 84. Prepared Rebuttal Testimony on behalf of the **Joint Solar** Parties (R. 14-07-002 September 30, 2015)
 - Electric rate design issues concerning proposals for the net energy metering successor tariff in California.
- 85. Prepared Direct Testimony on behalf of the **Solar** Energy Industries Association (A. 15-04-012—July 5, 2016)
 - Selection of Time-of-Use periods, and rate design issues for solar customers.

- 86. Prepared Direct Testimony on behalf of the **Solar** Energy Industries Association (A. 16-09-003 April 28, 2017)
 - Selection of Time-of-Use periods, and rate design issues for solar customers.
- 87. Prepared Direct Testimony on behalf of the **Solar** Energy Industries Association (A. 17-06-030 March 23, 2018)
 - Selection of Time-of-Use periods, and rate design issues for solar customers.

EXPERT WITNESS TESTIMONY BEFORE THE ARIZONA CORPORATION COMMISSION

- 1. Prepared Direct, Rebuttal, and Supplemental Testimony on behalf of **The Alliance for Solar Choice (TASC)**, (Docket No. E-00000J-14-0023, February 27, April 7, and June 22, 2016).
 - Development of a benefit-cost methodology for distributed, net metered solar resources in Arizona.
- 2. Prepared Surrebuttal and Responsive Testimony on behalf of the **Energy Freedom Coalition of America** (Docket No. E-01933A-15-0239 – March 10 and September 15, 2016).
 - Critique of a utility-owned solar program; comments on a fixed rate credit to replace net energy metering.
- 3. Direct Testimony on behalf of the **Solar Energy Industries Association** (Docket No. E-01345A-16-0036, February 3, 2017).
- 4. Direct and Surrebuttal Testimony on behalf of **The Alliance for Solar Choice and the Energy Freedom Coalition of America** (Docket Nos. E-01933A-15-0239 (TEP), E-01933A-15-0322 (TEP), and E-04204A-15-0142 (UNSE) May 17 and September 29, 2017).

EXPERT WITNESS TESTIMONY BEFORE THE COLORADO PUBLIC UTILITIES COMMISSION

- Direct Testimony and Exhibits on behalf of the Colorado Solar Energy Industries Association and the Solar Alliance, (Docket No. 09AL-299E – October 2, 2009). <u>https://www.dora.state.co.us/pls/efi/DDMS_Public.Display_Document?p_section=PUC&p_source=EFI_PRIVATE&p_doc_id=3470190&p_doc_key=0CD8F7FCDB673F1043928849D9D8CAB1&p_handle_not_found=Y
 </u>
 - Electric rate design policies to encourage the use of distributed solar generation.
- 2. Direct Testimony and Exhibits on behalf of the **Vote Solar Initiative** and the **Interstate Renewable Energy Council**, (Docket No. 11A-418E – September 21, 2011).
 - Development of a community solar program for Xcel Energy.
- 3. Answer Testimony and Exhibits, plus Opening Testimony on Settlement, on behalf of the **Solar Energy Industries Association**, (Docket No. 16AL-0048E [Phase II] June 6 and September 2, 2016).
 - Rate design issues related to residential customers and solar distributed generation in a Public Service of Colorado general rate case.

EXPERT WITNESS TESTIMONY BEFORE THE GEORGIA PUBLIC SERVICE COMMISSION

- 1. Direct Testimony on behalf of **Georgia Interfaith Power & Light and Southface Energy Institute, Inc.** (Docket No. 40161 – May 3, 2016).
 - Development of a cost-effectiveness methodology for solar resources in Georgia.

EXPERT WITNESS TESTIMONY BEFORE THE IDAHO PUBLIC UTILITIES COMMISSION

- 1. Direct Testimony on behalf of the Idaho Conservation League (Case No. IPC-E-12-27—May 10, 2013)
 - Costs and benefits of net energy metering in Idaho.
- 2. a. Direct Testimony on behalf of the **Idaho Conservation League and the Sierra Club** (Case Nos. IPC-E-15-01/AVU-4-15-01/PAC-E-15-03 — April 23, 2015)
 - b. Rebuttal Testimony on behalf of the **Idaho Conservation League and the Sierra Club** (Case Nos. IPC-E-15-01/AVU-4-15-01/PAC-E-15-03 — May 14, 2015)
 - Issues concerning the term of PURPA contracts in Idaho.
- 2. a. Direct Testimony on behalf of the **Sierra Club** (Case No. IPC-E-17-13 December 22, 2017)
 - b. Rebuttal Testimony on behalf of the **Sierra Club** (Case No. IPC-E-17-13 January 26, 2018)

EXPERT WITNESS TESTIMONY BEFORE THE MASSACHUSETTS DEPARTMENT OF PUBLIC UTILITIES

- 1. Direct and Rebuttal Testimony on behalf of **Northeast Clean Energy Council, Inc.** (Docket D.P.U. 15-155, March 18 and April 28, 2016)
 - *Residential rate design and access fee proposals related to distributed generation in a National Grid general rate case.*

EXPERT WITNESS TESTIMONY BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

- 1. Prepared Direct Testimony on behalf of Vote Solar (Case No. U-18419—January 12, 2018)
- 2. Prepared Rebuttal Testimony on behalf of the **Environmental Law and Policy Center**, the Ecology Center, the Solar energy Industries Association, Vote Solar, and the Union of Concerned Scientists (Case No. U-18419 — February 2, 2018)

EXPERT WITNESS TESTIMONY BEFORE THE MINNESOTA PUBLIC UTILITIES COMMISSION

- 1. Direct and Rebuttal Testimony on Behalf of **Geronimo Energy, LLC**. (In the Matter of the Petition of Northern States Power Company to Initiate a Competitive Resource Acquisition Process [OAH Docket No. 8-2500-30760, MPUC Docket No. E002/CN-12-1240, September 27 and October 18, 2013])
 - Testimony in support of a competitive bid from a distributed solar project in an all-source solicitation for generating capacity.

EXPERT WITNESS TESTIMONY BEFORE THE MONTANA PUBLIC SERVICE COMMISSION

- Pre-filed Direct and Supplemental Testimony on Behalf of Vote Solar and the Montana Environmental Information Center (Docket No. D2016.5.39,October 14 and November 9, 2016).
 - Avoided cost pricing issues for solar QFs in Montana.

EXPERT WITNESS TESTIMONY BEFORE THE PUBLIC UTILITIES COMMISSION OF NEVADA

- 1. Pre-filed Direct Testimony on Behalf of the Nevada Geothermal Industry Council (Docket No. 97-2001—May 28, 1997)
 - Avoided cost pricing for the electric output of geothermal generation facilities in Nevada.
- 2. Pre-filed Direct Testimony on Behalf of **Nevada Sun-Peak Limited Partnership** (Docket No. 97-6008—September 5, 1997)
 - *QF pricing issues in Nevada.*
- 3. Pre-filed Direct Testimony on Behalf of the Nevada Geothermal Industry Council (Docket No. 98-2002 June 18, 1998)
 - *Market-based, avoided cost pricing for the electric output of geothermal generation facilities in Nevada.*
- 4. a. Prepared Direct Testimony on behalf of **The Alliance for Solar Choice (TASC)**, (Docket Nos. 15-07041 and 15-07042 –October 27, 2015).
 - b. Prepared Direct Testimony on Grandfathering Issues on behalf of **TASC**, (Docket Nos. 15-07041 and 15-07042 –February 1, 2016).

- c. Prepared Rebuttal Testimony on Grandfathering Issues on behalf of **TASC**, (Docket Nos. 15-07041 and 15-07042 –February 5, 2016).
- *Net energy metering and rate design issues in Nevada.*

EXPERT WITNESS TESTIMONY BEFORE THE NEW HAMPSHIRE PUBLIC UTILITIES COMMISSION

- 1. Prepared Direct and Rebuttal Testimony on behalf of **The Alliance for Solar Choice** (**TASC**), (Docket No. DE 16-576, October 24 and December 21, 2016).
 - *Net energy metering and rate design issues in New Hampshire.*

EXPERT WITNESS TESTIMONY BEFORE THE NEW MEXICO PUBLIC REGULATION COMMISSION

- Direct Testimony on Behalf of the Interstate Renewable Energy Council (Case No. 10-00086-UT—February 28, 2011) http://164.64.85.108/infodocs/2011/3/PRS20156810DOC.PDF
 - Testimony on proposed standby rates for new distributed generation projects; cost-effectiveness of DG in New Mexico.
- 2. Direct Testimony and Exhibits on behalf of the New Mexico Independent Power **Producers** (Case No. 11-00265-UT, October 3, 2011)
 - Cost cap for the Renewable Portfolio Standard program in New Mexico

EXPERT WITNESS TESTIMONY BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

- Direct, Response, and Rebuttal Testimony on Behalf of the North Carolina Sustainable Energy Association. (In the Matter of Biennial Determination of Avoided Cost Rates for Electric Utility Purchases from Qualifying Facilities – 2014; Docket E-100 Sub 140; April 25, May 30, and June 20, 2014)
 - Testimony on avoided cost issues related to solar and renewable qualifying facilities in North Carolina.

April 25, 2014:

http://starw1.ncuc.net/NCUC/ViewFile.aspx?Id=89f3b50f-17cb-4218-87bd-c743e1238bc1 May 30, 2014: http://starw1.ncuc.net/NCUC/ViewFile.aspx?Id=19e0b58d-a7f6-4d0d-9f4a-08260e561443 June 20, 2104: http://starw1.ncuc.net/NCUC/ViewFile.aspx?Id=bd549755-d1b8-4c9b-b4a1-fc6e0bd2f9a2

EXPERT WITNESS TESTIMONY BEFORE THE PUBLIC UTILITIES COMMISSION OF OREGON

- 1. a. Direct Testimony of Behalf of **Weyerhaeuser Company** (UM 1129 August 3, 2004)
 - b. Surrebuttal Testimony of Behalf of **Weyerhaeuser Company** (UM 1129 October 14, 2004)
- 2. a. Direct Testimony of Behalf of **Weyerhaeuser Company and the Industrial Customers of Northwest Utilities** (UM 1129 / Phase II — February 27, 2006)
 - b. Rebuttal Testimony of Behalf of **Weyerhaeuser Company and the Industrial Customers of Northwest Utilities** (UM 1129 / Phase II — April 7, 2006)
 - Policies to promote the development of cogeneration and other qualifying facilities in Oregon.
- 3. Direct Testimony on Behalf of the **Oregon Solar Energy Industries Association** (UM 1910, 1911, and 1912 March 16, 2018).

EXPERT WITNESS TESTIMONY BEFORE THE PUBLIC SERVICE COMMISSION OF SOUTH CAROLINA

- Direct Testimony and Exhibits on behalf of The Alliance for Solar Choice (Docket No. 2014-246-E December 11, 2014) https://dms.psc.sc.gov/attachments/matter/B7BACF7A-155D-141F-236BC437749BEF85
 - Methodology for evaluating the cost-effectiveness of net energy metering

EXPERT WITNESS TESTIMONY BEFORE THE PUBLIC UTILITIES COMMISSION OF TEXAS

- 1. Direct Testimony on behalf of the **Solar Energy Industries Association** (SEIA) (Docket No. 44941 December 11, 2015)
 - *Rate design issues concerning net metering and renewable distributed generation in an El Paso Electric general rate case.*

EXPERT WITNESS TESTIMONY BEFORE THE PUBLIC SERVICE COMMISSION OF UTAH

- 1. Direct Testimony on behalf of the **Sierra Club** (Docket No. 15-035-53—September 15, 2015)
 - Issues concerning the term of PURPA contracts in Idaho.

EXPERT WITNESS TESTIMONY BEFORE THE VERMONT PUBLIC SERVICE BOARD

- 1. Pre-filed Testimony of R. Thomas Beach and Patrick McGuire on Behalf of Allco Renewable Energy Limited (Docket No. 8010 — September 26, 2014)
 - Avoided cost pricing issues in Vermont

EXPERT WITNESS TESTIMONY BEFORE THE VIRGINIA CORPORATION COMMISSION

Direct Testimony and Exhibits on Behalf of the Maryland – District of Columbia – Virginia Solar Energy Industries Association, (Case No. PUE-2011-00088, October 11, 2011) http://www.scc.virginia.gov/docketsearch/DOCS/2gx%2501!.PDF

• *Cost-effectiveness of, and standby rates for, net-metered solar customers.*

LITIGATION EXPERIENCE

Mr. Beach has been retained as an expert in a variety of civil litigation matters. His work has included the preparation of reports on the following topics:

- The calculation of damages in disputes over the pricing terms of natural gas sales contracts (2 separate cases).
- The valuation of a contract for the purchase of power produced from wind generators.
- The compliance of cogeneration facilities with the policies and regulations applicable to Qualifying Facilities (QFs) under PURPA in California.
- Audit reports on the obligations of buyers and sellers under direct access electric contracts in the California market (2 separate cases).
- The valuation of interstate pipeline capacity contracts (3 separate cases).

In several of these matters, Mr. Beach was deposed by opposing counsel. Mr. Beach has also testified at trial in the bankruptcy of a major U.S. energy company, and has been retained as a consultant in anti-trust litigation concerning the California natural gas market in the period prior to and during the 2000-2001 California energy crisis.