AFFIDAVIT

THE FAIR TRADING COMMISSION

IN THE MATTER of the Application by the Barbados Light & Power Company (the BLPC) requests the approval of the Fair Trading Commission (the Commission) to establish a Clean Energy Transition Rider Mechanism to recover the cost associated with its Clean Energy Transition Programme (CETP).

AFFIDAVIT OF PHILIP Q HANSER

I PHILIP Q HANSER, of 40 Cedar Street, Newton, MA 02459 in the country of the United States, being duly sworn hereby **MAKE OATH** and say as follows:

1. I am a Principal Emeritus of The Brattle Group and have nearly forty years of consulting and litigation experience in the energy industry. I specialize in regulatory and financial economics, especially for electric and gas utilities, in areas such as retail tariffs, transmission pricing, marginal and avoided costs, and integrated resource planning. I am experienced in environmental issues, forecasting, marketing and demand-side management, and other complex management and financial matters. I also provide assistance in statistical matters, including sample design and data analysis.

2. I have appeared as an expert witness before the U.S. Federal Energy Regulatory Commission (FERC), and numerous state public utility commissions, environmental agencies, Canadian utility boards, as well as arbitration panels, and in federal and state courts. Since 2009, I have taught

industry professionals about the principles and practice of cost of service calculations and rate design on behalf of the Edison Electric Institute in its Advanced Rates Course. I served for six years on the American Statistical Association's Advisory Committee to the Energy Information Administration (EIA). I am a member of the Institute of Electronics and Electrical Engineers (IEEE), the International Association for Energy Economics (IAEE) and the American Statistical Association(ASA.

3. Before joining The Brattle Group, I held teaching positions at the University of the Pacific, the University of California at Davis, and Columbia University. I have served as a guest lecturer at the Massachusetts Institute of Technology, Stanford University, and the University of Chicago. I was a Senior Associate in the Mossavar-Rahmani Center for Business and Government at the Harvard Kennedy School. At HKS, I co-led the Masters in Public Policy Business and Government concentration seminar in public policy analysis. I am currently a Lecturer in Northeastern University's Department of Economics. I was a Lecturer in Boston University's Questrom School of Business's Markets, Public Policy, and Law department and am a Senior Fellow in B.U.'s Institute for Sustainable Energy. I served as the manager of the Demand-Side Management Program at the Electric Power Research Institute (EPRI) and have been published widely in leading industry and economic journals.

4. A copy of my resume is attached hereto and marked as Exhibit "**PH1**."

5. In October 2018, The Brattle Group was retained by the BLPC to provide Rate Case Assistance, which included a review of performance incentive mechanisms. My colleagues, Mr. Bruce Tsuchida and Dr. Pearl Donohoo-Vallett of The Brattle Group and myself prepared the memorandum in Exhibit "**PH2,**" which discusses the proposed design of the CETR.

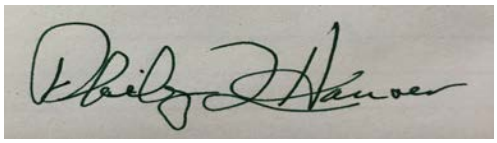
6. The purpose of my testimony is to present our analysis of tracker design and the design of the Clean Energy Transition Rider (CETR) as proposed by the

Barbados Light & Power Company Limited (BLPC) to recover expenses associated with the Clean Energy Transition Program (CETP), a 5-year bridging plan to support the Government's 100/100 Vision goals. The BLPC anticipates that the capital requirements of the CETP will be approximately $270 million, in addition to the sustaining capital required for normal system investments. Without an adjustment to the BLPC's regulatory environment, it represents that it will not be able to make the investments supporting the 100/100 Vision while maintaining a reasonable opportunity to earn its regulated return on equity, partially due to regulatory lag. The increased capital investments required to enable the 100/100 Vision goals merit consideration of adapting the current regulatory environment to allow for timely recovery of investments and efficient customer price signals.

7. The structure of the CETR contains multiple opportunities for intervenors to review proposed expenditures and allows for the possibility of a cap on CETP cost recovery, depending on the bill impact to customers. The proposed CETR includes pre-approval, before investments are made, for both broad categories allowed for recovery through the CETR and specific project projects. The CETR also includes a review of expenditures before added to the tracker for recovery. The BLPC anticipates that the CETP investments recovered through the CETR investments will be offset by fuel cost savings. If costs from the CETR exceed the fuel savings, the proposed design includes the possibility for the FTC to consider an annual rate increase cap, with revenues and appropriate interest delayed to subsequent years

8. The components of the CETR proposed by the BLPC generally follow regulatorily acceptable precedents for trackers and are matched to the operating context of the BLPC. Alternatives to a tracker, including the use of formula rates, multi-year rate plans, or holding annual rate cases, could similarly enable the required 100/100 Vision investments, but would likely present greater regulatory burden to the FTC, the BLPC, and stakeholders.

SWORN TO by **PHILIP Q HANSER**)



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at the)

this 18th day of June, 2020)

Before me:

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LEGAL ASSISTANT

EXHIBIT “PH1”

This is a copy of the document marked Exhibit “PH1” mentioned and referred to in paragraph 4 in the said Affidavit of Dr. Philip Q Hanser.

PHILIP Q HANSER

40 Cedar Street
Newton, MA 02459

+1.617.901.6935

PhilipQH@gmail.com

Philip Q Hanser is a principal emeritus of The Brattle Group and has nearly forty years of consulting and litigation experience in the energy industry. He specializes in regulatory and financial economics, especially for electric and gas utilities, in areas such as retail tariffs, transmission pricing, marginal and avoided costs, and integrated resource planning. He is experienced in environmental issues, forecasting, marketing and demand-side management, and other complex management and financial matters. He also provides assistance in statistical matters including sample design and data analysis.

He has appeared as an expert witness before the U.S. Federal Energy Regulatory Commission (FERC), and numerous state public utility commissions, environmental agencies, Canadian utility boards, as well as arbitration panels, and in federal and state courts. Since 2008, Mr. Hanser has taught industry professionals about the principles and practice of cost of service calculations and rate design on behalf of the Edison Electric Institute in its Advanced Rates Course. He served for six years on the American Statistical Association's Advisory Committee to the Energy Information Administration (EIA). He is a member of Institute of Electronics and Electrical Engineers (IEEE), International Association for Energy Economics (IAEE), the American Statistical Association (ASA) and was a member of Conseil International des Grands Reseaux Electriques (CIGRE).

Before joining The Brattle Group, he held teaching positions at the University of the Pacific, the University of California at Davis, and Columbia University. He has also served as a guest lecturer at the Massachusetts Institute of Technology, Stanford University, and the University of Chicago. He was a Senior Associate in the Mossavar-Rahmani Center for Business and Government at the Harvard Kennedy School. At HKS, he co-led the Masters in Public Policy Business and Government concentration seminar in public policy analysis. He is currently a Lecturer in Northeastern University's Department of Economics and was a Lecturer in Boston University's Questrom School of Business's Markets, Public Policy, and Law department. He is a Senior Fellow in B.U.'s Institute for Sustainable Energy. He served as the manager of the Demand-Side Management Program at the Electric Power Research Institute (EPRI) and has been published widely in leading industry and economic journals.

EDUCATION

Ph.D. Candidacy Requirements Completed, Columbia University, NY 1975

Phil.M. (Economics and Mathematical Statistics) Columbia University 1975

A.B. (Economics and Mathematics) The Florida State University, FL 1971

The University of California at Berkeley Engineering Extension Course
Time Series and Econometric Forecasting September 1979

Data Analysis and Regression, American Statistical Association
Short Course, San Diego, CA August 1978

ACADEMIC POSITIONS

Northeastern University, Lecturer
Department of Economics 2020 - present

Boston University, Questrom School of Business, Institute for Sustainable Energy
Senior Fellow 2017-2020

Boston University, Questrom School of Business, Markets, Public Policy, and Law
Lecturer 2017-present

Harvard Kennedy School
Senior Associate in the Mossavar-Rahmani Center for Business and Government
Co-Leader BGP-150Y Business and Government Policy Analysis Concentration Seminar 2012-2017

Massachusetts Institute of Technology, Cambridge, MA
Guest Lecturer, Energy Laboratory Short Courses 1997-1998

University of California, Davis; Davis, CA
Visiting Lecturer, Department of Economics 1981-1982

University of the Pacific, Stockton, CA
Assistant Professor, Departments of Economics and Mathematics 1975-1980

CONSULTING EXPERIENCE

Analysis of Electricity Generation, Contracts, and Wholesale Markets

- Provided expert testimony in Massachusetts state court on the impacts of alleged violations of a wholesale power contract on a supplier in ISO-NE.

- For the California Department of Water Resources, provided expert testimony in federal bankruptcy court concerning the public interest standard to be applied to Calpine Corporation's rejection of its contracts. This assignment included a valuation of the contract over time through the use of an original simulation model of the California market, as well as an assessment of the potential reliability implications for the California market.
- For the California Department of Water Resources and the California Attorney General's Office, provided expert testimony on damages resulting from Sempra Energy Resources breaches of its power purchase agreement in both arbitration hearings and before the California state court. I analyzed two years of hourly data on energy deliveries, market prices, ISO charges, and invoice charges to identify and evaluate performance violations and invoice overcharges. Assisted counsel in developing the theory of the case and provided general litigation support in preparation for and during the arbitration.
- For Dominion Electric Marketing, Inc. (DEMI), assisted in their response to a complaint by United Illuminating (UI) regarding their wholesale supply contract. The dispute centred on the allocation of reliability must-run costs between UI as a load-serving entity and DEMI as a wholesale supplier.
- For the California Department of Water Resources, reviewed the California ISO's proposed implementation of locational marginal pricing (LMP) and analyzed implications for "seller's choice" supply contracts. Developed a framework for quantifying the incremental congestion costs that ratepayers would face if suppliers delivered power to the lowest priced nodes, and estimated potential additional contract costs using a third party's GE-MAPS market simulations. Provided recommendations to the CAISO regarding how to address the issue.
- Provided expert testimony in Massachusetts state court on the damages incurred by a power plant developer as a result of alleged contractual violations by a supplier for a plant constructed in ISO-NE.
- For a Florida utility, provided a confidential expert report evaluating the benefits of the power from a co-generator and its potential rate implications, and assisted in the negotiation of a co-generation contract with a large industrial customer.
- Assisted a US electric utility in the preparation of a bid proposal to an industrial firm for the leasing of a new power plant. The assignment included risk analysis of the proposal, assessment of financial and rate impacts, and market assessment of competitors' potential offerings.
- For a merchant generation company, provided testimony on the fairness of a resource procurement action.

Resource Planning and Procurement

- For the Edison Electric Institute, co-authored a report on the general inapplicability of standard financial portfolio theory to the resource portfolios of utilities.
- For the investor-owned utilities of Wisconsin, provided testimony before the Public Service Commission of Wisconsin on cost of capital issues for use in its statewide resource planning exercise.
- For an international development bank, evaluated generation resource needs for an Eastern European country as well as providing a determination of alternative means to meet those generation needs. This assignment included analysis of the impact of privatization on the country's economy, its import and export sectors, and the future development of electricity and gas resources.
- For a western utility, developed an assessment of its resource options, with a particular view towards future environmental regulation.
- For a southern utility, assessed the value of adding a gas-fired generating station.

Environment

- For an eastern US utility with substantial coal-generating facilities, provided advice concerning maintenance procedures and risk exposure to New Source Review standards under the Clean Air Act Amendments.
- For a western generator with substantial coal-generating facilities, assisted its response to allegations by the Environmental Protection Agency of failure to comply with the New Source Review standards under the Clean Air Act Amendments.
- For Illinois Power Company, provided expert testimony in federal court on the regulatory and rate base implications of the Clean Air Act Amendments, in support of the calculation of noncompliance economic damages arising from New Source Review.
- For a gas utility, assisted in the development of potential manufactured gas liabilities for use in insurance recovery and in estimating possible recovery under a variety of insurance allocation theories and estimated risk distribution.
- For a gas utility, assisted in its assessment of the announcement effect of environmental liabilities on its cost of capital. This assignment included estimating changes in market betas for pre- and post- environmental liability announcement.

Energy Efficiency, Demand-Side Management, and Renewables

- For a large utility in the southern United States, prepared expert report investigating alternative cost allocation approaches for generation capacity, fuel, and demand-side management (DSM) costs, both through a review of the methods, surveys of practice, as well as the financial impacts on the utility. The cost allocation assessment included cost allocation across jurisdictions as well as within a jurisdiction.
- For Central Vermont Public Service, provided expert testimony on the impact of its DSM programs before the Vermont Public Service Board.
- For Ameren/UE's Illinois subsidiaries, provided expert testimony on the potential for gas DSM and resulting potential rate implications.
- For a northeastern utility, developed an assessment of the potential penetration rate of microturbines. For the utility service territories under consideration, evaluated the back-up generation rates and connection charges likely to be incurred for such systems to determine customer costs and benefits.
- For a utility located in the Western Electric Coordinating Council (CC), procuring renewable resources, provided a system integration study for a range of renewable project proposals. Used production costing and power flow models to estimate the "deliverability" of various proposals, including estimating locational marginal prices (LMPs) and potential congestion costs. Ranked the proposed renewable power projects by their estimated benefits and costs and delivered a formal presentation to the utility's executives at the project's completion.
- For a power marketer and developer of independent power projects in Great Britain, assisted in the preparation of comments on proposals by the UK pool regarding the role of demand-side bidding and the pricing of transmission losses.
- For a Texas utility, provided expert testimony regarding breach of contract claims made against it by an industrial participant in an energy efficiency project. Reviewed the energy efficiency impacts of the program. Calculated the net present value of the project under various rate options and market prices.
- For Connecticut Light and Power, provided testimony in support of its Application for a Certificate of Environmental Compatibility and Public Need for the construction of a 345-kV electric transmission line and reconstruction of an existing 115-kV electric transmission line. At issue was the use of distributed resources to substitute for the proposed lines.

Analysis of Market Power

- For the California Parties, provided litigation support and testimony regarding manipulation of energy and ancillary service market prices and the outage behaviour of gas-fired power plants during 2000-01. The proceeding, before the Federal Energy Regulatory Commission, involved Enron, Dynegy, Mirant, Reliant, Williams, and other suppliers in the US and Canada. The analyses focused on the use by suppliers of generation outages to affect market prices through physical withholding, as well as the use of pricing to yield economic withholding.
- For the California Parties, provided litigation support and testimony regarding Enron's transmission and ancillary services market manipulation strategies, including 'Death Star' and 'Get Shorty.'
- For Southern California Edison, submitted testimony before the FERC describing the implications of manipulation of gas market prices on the electricity market.
- For Sierra Pacific Resources Company, provided expert testimony before the Public Utilities Commission of Nevada and the FERC regarding the market power implications of generation asset divestiture required for the merger of Sierra Pacific Power and Nevada Power Company, developed a Cournot market model to assess the market power implications of selling off alternative groupings of generation.
- For the Pennsylvania-New Jersey-Maryland Interconnection, LLC (PJM), co-authored the annual report on the state of its markets. The report included an assessment of the market's competitiveness and potential structural deficiencies and identified potential instances of market abuse.
- For PJM, developed an ensemble of metrics for assessing market power in its markets. The metrics included an early warning system to permit PJM interventions into market abuse at the most initial possible stage.
- For PJM, developed software for unilateral market power assessment and assisted PJM in its preliminary implementation. Its use was validated through an incident involving potential market power abuse by PJM members.

R.T.O. Design and Participation

- For Northeast Utilities, provided testimony before the FERC about the economics of imposing local installed capacity (LICAP) requirements on ISO-NE. Also provided expert testimony before the FERC in support of its applications for market-based rate authority.

- For NSTAR, provided testimony before the FERC on several matters: first, the necessity of imposing bid caps on the New England electricity market; second, replacement energy rates for generators when the transfer capability into a transmission-constrained zone was reduced because of system upgrades; and third, the appropriateness of granting market-based rate authority to a generator in a transmission-constrained zone. Developed a Cournot market model to forecast the potential impact on market prices in the transmission-constrained zone in which the majority of NSTAR's service territory is located.
- For Nevada Power Company, provided expert testimony before the FERC for its market-based rate authority application.
- For Otter Tail Power Company, provided an affidavit to the FERC assessing how the Midwest ISO's proposed Transmission and Energy Market Tariff would affect Otter Tail Power, both operationally and financially. Based on the strategies that were pursued by some market participants during the 2001 California electricity market crisis, demonstrated the potential to pursue similar strategies in MISO and harm Otter Tail and its customers.
- For Edison Mission Energy's subsidiary, Midwest Gen provided expert testimony to the FERC for its market-based rate authority application.
- For a Midwest utility, examined the implications of alternative configurations of the independent system operator (ISO) on potential market power concerns. The issue particularly examined was the question of seams and how different ISO configurations affected the costs of transactions.
- Co-authored a report for the New York Independent System Operator assessing the reliability implications of modifying its rules regarding installed capacity.
- Submitted testimony to the Public Utilities Commission of Texas (PUCT) regarding a proposed rule to allocate the costs of procuring replacement reserves to market participants in ERCOT.
- For the Edison Electric Institute, authored a report on standard market design and its implications for utilities within regional transmission organizations.

Forecasting and Weather Normalization

- For the Pennsylvania-New Jersey-Maryland Interconnection, LLC (PJM), co-authored an assessment of its forecasting model
- For Florida Power and Light Co., provided testimony before the Florida Public Service Commission concerning its forecasting methodology.
- For an electric utility in the Southeast, reviewed the existing weather normalization process and diagnosed problems with weather data and regression models. Developed alternative daily and monthly normalization models, improved degree-day specification, selection of weather stations, and regression specification to double prediction accuracy and enhance the stability of the weather-normalization process.
- For PJM, conducted a review of models for forecasting peak demand and re-estimated new models to validate recommendations. Models were developed for 18 individual transmission zones as well as for the entire PJM system.
- For a Southwestern utility, developed models for forecasting monthly sales and loads for residential, commercial and industrial customer classes using primary data on customer loads, weather conditions, and economic activity.
- For the Public Service Company of New Mexico, provided expert testimony before the Public Utilities Commission of New Mexico regarding the forecasted growth of the El Paso, Texas and Juarez, Mexico markets and their electricity requirements.
- For a Southeastern utility, developed a model for forecasting monthly demand that incorporated the impacts of its significantly declining housing market and which served as the basis for its treasurer's revenue forecast.

Rate Design and Related Issues

- Expert report on behalf of the Newfoundland and Labrador Board of Commissioners of Public Utilities: Review of Existing and Proposed Network Additions Policies for Newfoundland and Labrador Hydro, with Agustin Ros and Peal Donohoo-Vallet, November 19, 2019
- Testimony before the Virginia Corporation Commission, Case No. PUR-2019-00104, on behalf of the Virginia Electric Power Company on cost allocation of utility-scale solar projects, July 1, 2019, with Agustin Ros.

- Expert report on behalf of the Newfoundland and Labrador Board of Commissioners of Public Utilities: Embedded and Marginal Cost of Service Review, with Agustin Ros, T. Bruce Tsuchida, Pearl Donohoo-Vallet, and Lynn Zang, May 3, 2019.
- For a Midwest utility, provided support for its rate designs, including its cost of service development and certification of conformance with state regulations.
- For an industrial customer, provided testimony before a state public utility commission on the appropriate cost allocation and rate design approach for a municipal water utility.
- For a utility in PJM, performed a marginal cost/avoided cost study to be used in evaluating its demand-side management energy efficiency programs, demand-responsive rates, and seasonal and time-of-use rates. The study included a geographic-specific assessment of its marginal distribution and transmission costs.
- For intervenors in Toronto Hydro-Electric System Limited (THESL), provided testimony on cost allocation issues concerning THESL's suite metering program.
- For Ameren/UE's Missouri subsidiary provided expert testimony on its rate design before the Missouri Public Utility Commission. Assisted the development of company witnesses' rationale for the choice of cost of service allocation method, developed benchmarks for the rate increase against similarly situated utilities, as well for other commodities' escalations, and evaluated proposed demand-side management programs and rate options.
- For Ameren/UE's Illinois subsidiaries, provided expert testimony on the potential for gas demand-side management. The testimony discussed the potential rate implications of such programs on the revenue of the utilities.
- For the Edison Electric Institute, co-authored a series of papers concerning issues facing utilities. The reports covered the topics of fuel adjustment clauses, mitigating significant rate increase impacts, and the Energy Policy Act of 2005.
- For the City of Vernon, California, submitted testimony to the FERC regarding its revenue requirements for transmission and provided testimony regarding its formula rates.
- For the Edison Electric Institute, served as an instructor in the Advanced Rates School on the topics of cost allocation, rate design, and marginal costs.
- For the ISO-NE, served as an instructor on retail cost allocation and ratemaking.
- For Hydro Québec, provided testimony before the Régie d'Énérgie regarding the conformance of its Open Access Transmission Tariff with US FERC regulations.

- Before staff members of the FERC, assisted in the development of a review of the implications of the restructuring in transmission assets' cost of capital and wholesale rates.
- For a power marketer and developer of independent power projects in Great Britain, assisted in the preparation of comments on proposals by the UK pool regarding the pricing of transmission losses and the role of demand-side bidding.
- For a utility in PJM with multiple jurisdictions provided an assessment of alternative demand and energy cost allocation procedures. The report included separate assessments for each jurisdiction as well as an assessment for generation and transmission assets commonly shared by all jurisdictions.
- For a European transmission company, provided an analysis of the likely development of the European electricity market and assessed market implications for the transmission company of modifications to the transmission grid.
- For Hydro Québec, provided expert testimony before the Régie d'Énérgie regarding whether a set of privately held transmission facilities constituted a looped transmission system and, thus, was subject to requests for transmission service.
- For Omaha Public Power District, assisted in the performance of its cost of service study, retail and wholesale rate designs. Also redesigned its cost of service models. Also provided support in the redesign of its formula rates for the Southwest Power Pool.
- For Arizona Public Service, provided assistance in the development of a cost of service basis for separating its residential customers with rooftop solar photovoltaic into a separate rate class.
- For Nevada Power, provided assistance in the development of a cost of service basis for separating its residential customers with rooftop solar photovoltaic into a separate rate class.
- For Pacific Gas and Electric, redesigned the marginal cost of service models, as well as their software implementation, for revenue cycle services and distribution system costs.
- For Wolverine Power Cooperative, provided testimony to the FERC supporting its request for formula transmission rates.
- For the Hawaii Electric Company, assessed alternative performance incentive mechanisms in a report which was submitted to the Hawaii Public Utility Commission.
- For FirstEnergy/Jersey Central Power and Light, assisted in the development of their cost of service study submitted to the New Jersey Board of Public Utilities.
- For National Grid, assessed alternative performance incentive mechanisms in a report which was submitted to the Massachusetts Department of Public Utilities.

- For Salt River Project, assisted with its current OATT compliance with FERC regulations.

Plant Performance and Strategy

- For the Keystone-Conemaugh Project Office, performed a benchmarking analysis to identify the areas in which Keystone and Conemaugh coal units were better performing or under-performing compared to other units with similar characteristics. The study involved comparing the historical operational and cost performance of the Keystone and Conemaugh coal units against their peer groups; identifying the areas where the performance of the Keystone and Conemaugh coal units were above and below the average quartile of their peer groups, and developing metrics and methodologies to combine the results of individual comparisons across the operational and cost performance assessments.
- For a US electric utility, assisted in the development of a legislative and regulatory strategy concerning restructuring. This assignment included generation asset valuation in a competitive market, development of stand-alone transmission and distribution rates under cost-of-service and performance-based regulation, and estimation of stranded costs.

Utility Financial Issues

- For the Edison Electric Institute, co-authored a report on the general inapplicability of standard financial portfolio theory to the resource portfolios of utilities.
- For a gas utility, assisted in the assessment of the announcement effect of environmental liabilities on its cost of capital. This assignment included estimating changes in market betas pre- and post-environmental liability announcement.
- For the investor-owned utilities of Wisconsin, provided testimony before the Public Service Commission of Wisconsin on cost of capital issues for use in its statewide resource planning exercise.
- For the developer of a synthetic natural gas plant in Indiana, provided testimony before the Indiana Utility Regulatory Commission on the appropriate approach to assessing financial risk for the plant.
- For the developer of a synthetic natural gas plant in Illinois provided a series of testimonies before the Illinois Commerce Commission on the appropriate cost of equity for the plant.
- For the developer of a synthetic natural gas plant in Illinois, provided testimony before the Illinois Construction Development Board on the appropriate range of capital costs and operations and maintenance expenses.

Other Energy Experience

- For the Edison Electric Institute, conducted its annual workshop for Electric Rate Advanced Course, "Introduction to Efficient Prices," University of Wisconsin, Madison, July 2009 - 2019.
- For the Edison Electric Institute, conducted its annual workshop for Electric Rate Advanced Course, "Rate Class Cost Allocation," University of Wisconsin, Madison, July 2009 - 2019.
- For the Edison Electric Institute, conducted its annual workshop for Electric Rate Advanced Course, "Ratemaking by Objective: It Can Be Done," University of Wisconsin, Madison, July 2009 - 2019.
- For the Edison Electric Institute, conducted Pre-Course Workshop for Electric Rate Advanced Course, "Traditional Embedded Costing and Pricing Concepts," University of Wisconsin, Madison, July 26, 2009.
- For the Edison Electric Institute, conducted a workshop for its Electric Rate Advanced Course, "Unbundling Methodologies," University of Wisconsin, Madison, July 26, 2009.
- For the Edison Electric Institute, conducted webinar "Long-Term Energy Forecasts: Challenges and Approaches," June 17, 2009.
- For the Indiana Energy Conference, presented "It Ain't Your Father's IRP, Meeting Today's Challenges," October 2, 2008.
- For the NEPOOL Forecasting Committee Summer Meeting, presented "I'm a Forecaster – And You Can Too!," July 17, 2008.
- For the Electric Power Research Institute (EPRI), developed and directed a research program to provide electric utilities with the following capabilities: marketing research, pricing and rate design, integrated resource planning, capital budgeting, environmental impacts of electric utilities and end-use technologies, load research, forecasting, and demand-side management through software tools, database development, and technology development. Assisted in the development of the Load Management Strategy Testing Model (LMSTM) and served as its project manager, served as the project manager for the development of DSManager, a software for assessing efficiency programs for electric, gas, and water utilities, enhancements to the Electric Generation Expansion Analysis Model (EGEAS). Co-wrote reports on the environmental impacts of electric technologies, environmental externalities, cost-benefit analysis of DSM programs, rate design and costing, integrated resource planning, operational impacts of interruptible and curtailable rates,

product differentiation, activity-based costing, DSM program evaluation, efficiency program development for electric, gas, and water utilities and others.

- For EPRI, I served as project manager of the Edison Electric Institute (EEI), National Rural Electric Cooperatives Association (NRECA), American Public Power Association (APPA.), and National Association of Regulatory Utility Commissioners (NARUC) jointly sponsored Electric Utility Rate Design Study (EURDS). Represented the Institute before various regulatory commissions, federal agencies, and utility executives. Also for EPRI, served on the Environmental Protection Agency's advisory committee for the Clean Air Act Amendments and as the operating agent for Annex IV, Improved Methods for Integrating Demand-Side Options into Utility Resource Planning, of the International Energy Agency Agreement on Demand-Side Management.
- For a California utility, supervised short- and long-term forecasts of sales and peak demand for use in resource and corporate planning. Supervised and helped prepare forecast documentation for public hearings before the California Energy Commission and represented the utility to the Commission on the forecast. Managed the design and implementation of long-term strategic planning and financial models, and prepared both marginal and embedded cost of service studies for the utility and assisted in their use for the design of customer rates. Evaluated the impact of energy conservation programs and legislation on long-term system resource requirements. Designed and implemented the residential survey of appliance holdings and commercial customer equipment survey.

Statistics and Sampling

- Designed a statistically valid database sampling procedure for assessing the validity of insurance claims arising from mass tort actions. The database contained summary information on the claims, and, for each claim, there was, at times, voluminous information on the individual cases. The sampling procedure was used to determine which records would be chosen and assessed the individual's claim eligibility. That would then serve as a basis for calculating an appropriate rate per dollar claim.
- Assessed the liability risk of an insurance company that provided coverage relevant to a mass tort suit. Developed a Markov chain model to estimate the size of the potential population, and then a risk model was developed to calculate potential exposure.
- Developed a time to failure model to test the claims of generators during the California Electricity Crisis that their outage rates were not abnormal.

- Submitted testimony in bankruptcy court regarding the estimation of inventory subject to reclamation by a wholesale pharmaceuticals supplier, which was sold to a bankrupt retail drug chain. The retail chain failed to maintain proper inventory records. Developed a statistical approach to estimate inventory levels, which used a combination of data on overall inventory and the shipment and replenishment records of the supplier.

TESTIMONY AND REGULATORY FILINGS

Expert report on behalf of the Newfoundland and Labrador Board of Commissioners of Public Utilities: Review of Existing and Proposed Network Additions Policies for Newfoundland and Labrador Hydro, with Agustin Ros and Pearl Donohoo-Vallet, November 19, 2019.

Before the New York Department of Public Service, Granular Distribution Marginal Costs for Orange and Rockland Utilities, July 2019

Testimony before the Virginia Corporation Commission, Case No. PUR-2019-00104, on behalf of the Virginia Electric Power Company on cost allocation of utility-scale solar projects, July 1, 2019, with Agustin Ros. (Incorporates previously unfiled report for Virginia Electric Power.)

Expert report on behalf of the Newfoundland and Labrador Board of Commissioners of Public Utilities: Embedded and Marginal Cost of Service Review, with Agustin Ros, T. Bruce Tsuchida, Pearl Donohoo-Vallet, and Lynn Zhang, May 3, 2019.

Before the Salt River Project Board of Directors, Board Advisor report regarding SRP management's proposed rates, December 2018

Before the New York Department of Public Service, Granular Distribution Marginal Costs for Consolidated Edison with T. Bruce Tsuchida, July 2018

Before the Pennsylvania Public Utility Commission, Class Cost of Service Analysis for Philadelphia Gas Works, February 2017.

Before The Minnesota Public Utilities Commission, Docket No. E017/CG-16-1021, Expert Testimony on Behalf of Otter Tail Power, In the Matter of a Complaint by Red Lake Falls Community Solar Hybrid, LLC Regarding Potential Purchased Power Agreement (PPA) Terms and Pricing with Otter Tail Power Company.

Prepared Expert Report on Behalf of Nova Scotia Power Incorporated (NSPI), regarding the review and assessment of performance measures, July 13, 2016.

Before the New Jersey Board of Public Utilities, filed "Prepared Direct Testimony of Philip Q Hanser on behalf of Jersey Central Power & Light Company," regarding Cost of Service/Class Allocation, April 2016.

Before the United States District Court for The District of Montana Billings Division, Case no: CV 13-32-BLG-DLC-JCL, filed "Expert Report of Philip Q Hanser on Behalf of Defendants," regarding the evaluation of potential impacts of capital maintenance, repair and replacement projects on emissions from four Colstrip Units, November 14, 2014.

Before the Hawai'i Public Utilities Commission, Docket No. 2013-0141, filed "Targeted Performance Incentives: Recommendations to the Hawaiian Electric Companies" with William P. Zarakas, regarding the analysis of the Application of performance incentives to electric utilities, September 15, 2014.

Before the Federal Energy Regulatory Commission, Docket No. ER15-249-000, filed "Prepared Direct Testimony of Philip Q Hanser on behalf of Wolverine Power Supply Cooperative, Inc." regarding a Request for Change in Rates to Distribution Cooperative Member-Owners, October 30, 2014.

Before the Public Utilities Commission of the State of Colorado, Proceeding No. 13F-0145E, "Answer Testimony and Exhibits of Philip Q Hanser on behalf of Tri-State Generation and Transmission Association, Inc.," regarding an Analysis of Complaining Parties' Responses to Tri-State Generation and Transmission Association, Inc., September 10, 2014.

Before the Public Service Commission of Wisconsin, Docket No. 3720-WR-108, filed "Direct Rebuttal and Surrebuttal Testimony of Philip Q Hanser on behalf of MillerCoors LLC" regarding the Application of Milwaukee Water Works for Authority to Increase Water Rates, June 2014.

Before the District Court for the Eastern District of Missouri, Civil Action No. 4:11-cv-00077-RWS, filed "Expert Report of Philip Q Hanser on behalf of Ameren Missouri," regarding the New Source Review enforcement case, May 16, 2014.

Before the Illinois Commerce Commission of the State of Illinois, Docket No. 13-0387, filed "Rebuttal Testimony of Philip Q Hanser on behalf of Commonwealth Edison Company," regarding their tariff filing to present the Illinois Commerce Commission with an opportunity to consider revenue-neutral tariff changes related to rate design authorized by subsection 16-108.5(e) of the Public Utilities Act, August 19, 2013.

Before the Public Utilities Commission of the State of South Dakota, EL 11-006, filed "Wind Integration Services - Summary of Industry Practices in North America, on behalf of NorthWestern Energy," in the Matter of the Complaint by Oak Tree Energy LLC against NorthWestern Energy for refusing to enter into a Purchase Power Agreement, July 8, 2013.

Before the Régie de l'énergie, R-3848-2013, filed "Direct Testimony of Philip Q Hanser on Behalf of Hydro-Québec Distribution" regarding their Application for approval of characteristics of Wind Integration Services and acquisition analysis of other wind integration services, June 2013, January 2014.

Before the Federal Energy Regulatory Commission, "Prepared Direct Testimony of Philip Q Hanser on behalf of NV Energy Operating Companies," regarding whether the use of a 12-CP cost allocation method is appropriate for the NV Energy transmission system from a cost allocation perspective, May 2013.

Before the Federal Energy Regulatory Committee, Prepared Direct and Rebuttal Testimony and Exhibits of Philip Q Hanser in Support of the Refund Claims of the City of Seattle, Washington, for the Period January 1, 2000 through December 24, 2000, on behalf of the City of Seattle, Washington, EL01-10-085, March 12, 2013, June 3, 2013, July 26, 2013.

Before the Commonwealth of Massachusetts Department of Public Utilities, "Review and Analysis of Service Quality Plan Structure In the Massachusetts Department of Public Utilities Investigation Regarding Service Quality Guidelines for Electric Distribution Companies and Local Gas Distribution Companies," with David E. M. Sappington and William P. Zarakas, as part of the Initial Comments of National Grid, DPU12-120, March 2013.

Before the Bonneville Power Administration, Direct and Rebuttal Testimony of Philip Q Hanser, John D. Martinsen, Felicienne NG, James M. Russell, and Paul Wrigley on Behalf of Benton County Public Utility District No. 1, Iberdrola Renewables, LLC, Tacoma Power, Seattle City Light, and Snohomish County Public Utility District No. 1, Docket No. BP-14-E-JP12-01, January 28, 2013, March 11, 2013.

Before the Illinois Commerce Commission, Report of Philip Q Hanser on Behalf of Chicago Clean Energy, LLC, on the Reasonableness of Chicago Clean Energy's Cost of Equity, October 2011; Supplemental Report on Behalf of Chicago Clean Energy, LLC, November 2011; Response Report of Philip Q Hanser on Behalf of Chicago Clean Energy, November 2011, Certified Affidavit on Behalf of Chicago Clean Energy, LLC, December 2011.

Before the Louisiana Public Service Commission, Direct Testimony of Philip Q Hanser on Behalf of Calpine Corporation, Docket No. U-31971, November 22, 2011. (Testimony was withdrawn as part of the settlement between Calpine and Entergy.)

Before the Illinois Construction Development Board, Supplemental Report of Philip Q Hanser on Behalf of Chicago Clean Energy, LLC, on the Reasonableness of Chicago Clean Energy's Estimate of Capital Costs, November 2011. Supplemental Report of Philip Q Hanser on Behalf of Chicago Clean Energy, LLC, on the Reasonableness of Chicago Clean Energy's Estimate of Operations and Maintenance Expenses, November 2011.

Before the Indiana Utility Regulatory Commission, Rebuttal Testimony of Philip Q Hanser on Behalf of Indiana Gasification, LLC, IURC Case No. 43976, June 2011.

Before the State of Illinois Commerce Commission, Prepared Direct Testimony of Philip Q Hanser on behalf of Interstate Power and Light Company with regard to their Petition For Approval Of Sale of Utility Assets Pursuant to Sections 7-102 Of The Public Utilities Act; and Approve the Discontinuance of Service Pursuant to 8-508 of the Public Utilities Act, 2011.

Before the Federal Energy Regulatory Commission, Supplemental Comments, Re: Notice of Proposed Rulemaking regarding Demand Response Compensation in Organized Wholesale Energy Markets," Docket Nos. RM10-17-000 and EL09-68-0, October 4, 2010, May 13, 2010.

Before the Régie de l'énergie, Prepared Expert Report of Philip Q Hanser on Behalf of Hydro-Québec TransÉnergie ("HQT"), Regarding HQT's Methodology for ATC Coordination, June 2010.

Before the Commonwealth of Massachusetts Trial Court, testified on behalf of MMWEC regarding the management and ownership of investor-owned utilities ("IOUs"), MMWEC, and municipal light departments ("Municipals") in Massachusetts before and after the passage of the Electric Industry Restructuring Act of 1997, as well as the impact of electric industry restructuring in Massachusetts on IOUs, MMWEC, and Municipals with respect to contract buyouts in the matter of MASSPOWER v. Massachusetts Municipal Wholesale Electric Company (MMWEC), Civil Case No. 07-3243 BLS2, March 2010.

Before the Ontario Energy Board, Prepared Witness Statement on Behalf of the Smart Sub-Metering Working Group in the Matter of Toronto Hydro-Electric System Limited's 2010 Electricity Distribution Rate Application, December 15, 2009.

Before the Superior Court of the State of California for the County of San Diego, Prepared Second Addendum Report to Expert Report of Philip Q Hanser, for the Office of the Attorney General of the State of California on Behalf of California Department of Water Resources, Case No. GIC 789291, September 30, 2009.

Before the Florida Public Service Commission on behalf of Florida Power and Light Company, Prepared Rebuttal Testimony of Philip Q Hanser, Docket No. 080677-EI, August 6, 2009.

Before the Federal Energy Regulatory Commission on behalf of the City of Vernon, California, Prepared Petition for Declaratory Order and Request for Waiver of Filing Fee of City of Vernon, California, Docket No. EL09-___-000, July 15, 2009.

Before the Régie de l'énergie, Prepared Supplemental Expert Report of Philip Q Hanser on Behalf of Hydro-Québec TransÉnergie, in Response to Newfoundland and Labrador Hydro's Complaint P-110-1692, June 2009.

Before the Federal Energy Regulatory Commission, on behalf of The People of the State of California, ex rel. Edmund G. Brown Jr., Direct Testimony of Philip Q Hanser regarding emergency purchases the state authorized the California Energy Resources Scheduling Division of the California Department of Water Resources ("CERS") to make when the California investor-owned utilities (IOUs) could not purchase the power needed to serve their customers, Docket No. EL09- __ ("Brown Complaint"), May 22, 2009.

Before the Florida Public Service Commission on behalf of Florida Power and Light Company, Prepared Direct Testimony of Philip Q Hanser, Docket No. 080677-EI, April 23, 2009.

Before the Superior Court of the State of California for the County of San Diego, for the Office of the Attorney General of the State of California on Behalf of California Department of Water Resources, Prepared Addendum to Expert Report of Philip Q Hanser, Case No. GIC 789291, March 31, 2009.

Before the Pennsylvania Public Utility Commission on Behalf of Pennsylvania Electric Company, Prepared Rebuttal Testimony of Philip Q Hanser and Metin Celebi Concerning the Causes and Pricing of Transmission Congestion, Docket No. P-2008-2020257, January 16, 2009, March 10, 2009.

Before the Régie de l'énergie, Prepared Expert Report of Philip Q Hanser on Behalf of Hydro-Québec TransÉnergie, in Response to Newfoundland and Labrador Hydro's Complaints P-110-1565, P-110-1566, P-110-1597, P-110-1678, and P-110-1692, December 2008.

Before the Pennsylvania Public Utility Commission, on Behalf of Pennsylvania Electric Company, Prepared Direct Testimony of Philip Q Hanser Concerning the Causes and Pricing of Transmission Congestion, Docket No. P-2008-2020257, July 30, 2008.

Before the Régie de l'énérgie, Prepared Affidavit on Behalf of Hydro-Québec Regarding the Public Availability of S.I.S. Reports Performed by a Transmission Provider, June 19, 2008.

Before the Federal Energy Regulatory Commission, Prepared Direct Testimony on Behalf of the City of Vernon's Revised Transmission Revenue Requirement Filing with the FERC, Docket No. EL08-__-000, April 3, 2008.

Before the Régie de l'énérgie, Prepared Expert Report on Behalf of Hydro-Québec TransÉnérgie to Assess Whether the Transmission Facilities Owned by E.L.L. may be considered as a "Radial Generator Lead," Case No. R-3636-2007, March 13, 2008.

Before the Illinois Commerce Commission, Prepared Direct Testimony on Behalf of the Illinois Power Company d/b/a AmerenIP in regard to the energy efficiency programs that have been implemented by natural gas distribution utilities in the US, Docket No. 07-__, November 2, 2007.

Before the American Arbitration Association, Prepared Rebuttal Report on Behalf of the California Department of Water Resources to Evaluate the Reports that William Hogan, Jeffrey Tranen, and Ellen Wolfe Provided on Behalf of Sempra Generation, Case No. 74Y1980019606MAVI, June 4, 2007.

Before the American Arbitration Association, Prepared Expert Report on Behalf of the California Department of Water Resources to evaluate certain claims made by the California Department of Water Resources ("DWR") in its Demand for Arbitration regarding the performance of Sempra Energy Resources, now known as Sempra Generation, under the Energy Purchase Agreement between the parties, and to calculate amounts that Sempra would owe to DWR assuming liability is established, Case No. 74Y1980019606MAVI, May 14, 2007.

Before the United States Bankruptcy Court, Northern District of Ohio, Eastern Division, Prepared Expert Report in regard to McKesson's Inventory Reclamation in the Phar-Mor Bankruptcy, Case Nos. 01-44007 Through 01-44015, March 9, 2007.

Before the Public Utility Commission of Texas, Prepared Rebuttal Testimony on Behalf of Constellation New Energy, Inc.'s Appeal and Complaint of ERCOT Decision to Approve PRR 676, PRR 674 and Request for Expedited Relief, Docket No. 33416, January 11, 2007.

Before the Public Utility Commission of Texas, Prepared Direct Testimony on Behalf of Constellation NewEnergy, Inc. to analyze and discuss the flaws and potential negative impacts of the allocation methods under Protocol Revision Request ("PRR") 676 which relates to procurement costs for Replacement Reserve Service ("RPRS") and Out of Merit Capacity, Docket No. 33416, November 22, 2006.

Before the American Arbitration Association, Prepared Rebuttal Report on Behalf of the California Department of Water Resources vs. Sempra Energy Resources, Case No. GIC 789291, July 11, 2006.

Before the State Office of Administrative Hearings, Prepared Expert Report on Behalf of TXU Energy Solutions, Regarding their Demand-side Management Program and the Difference Between the Actual and Projected Savings in the Energy Bill of the University of Texas, July 7, 2006.

Before the Missouri Public Service Commission, Prepared Direct Testimony on Behalf of Union Electric Company with regard to Ameren UE's Rate Design Proposals, Case No. ER-2007-0002, July 5, 2006.

Before the Superior Court of the State of California for the County of San Diego, for the Office of the Attorney General of the State of California on Behalf of California Department of Water Resources, Prepared Expert Report, Case No. GIC 789291, June 9, 2006.

Before the Superior Court of the State of California, Prepared Declaration in Support of California State Agencies' Opposition to Motion on Shortened Time and Motion in Support of Preliminary Approval of Class Action Settlement, JCCP Nos. 4221, 4224, 4226 and 4228, June 8, 2006.

Before the Superior Court of the State of California, Prepared Declaration in Support of California State Agencies' Opposition to Proposed Publication Notice, JCCP Nos. 4221, 4224, 4226 and 4228, January 13, 2006.

Before the United States Bankruptcy Court, Prepared Declaration on Behalf of Calpine Corporation with regard to the Public Interest Standard for the Rejection of the Contract, Case No. 05-60200 (B.R.L.), December 30, 2005.

Before the FERC, Prepared Direct Testimony on Behalf of Dominion Energy Marketing, Inc. (DEMI), regarding a dispute between DEMI and The United Illuminating Company as to which party is responsible for paying certain costs associated with Reliability Must-Run agreements under a December 28, 2001, Power Supply Agreement between the two parties, Docket No. EL05-76-001, December 5, 2005.

Before the American Arbitration Association, Prepared Expert Report on behalf of the California Department of Water Resources vs. Sempra Energy Resources with regard to Damages from Multiple Contract Breaches, Case No. 74Y1980019304VSS, May 2005.

Before the Federal Energy Regulatory Commission (FERC), Comment - "A Marginal - Value Approach to Pricing Reactive Power Services in Principles for Efficient and Reliable Reactive Power Supply and Consumption," Docket No. AD05-1-000, April 4, 2005, (with Martin Baughman and Philip Hanser).

Before the FERC, Prepared Supplemental Testimony on Behalf of the California Parties with regard to Enron's Circular Scheduling and Paper Trading Gaming Practices, Docket No. EL03-180-000, January 31, 2005.

Before the FERC, Prepared Affidavit on Behalf of Northeast Utilities Service Company and Affiliated Companies' Market-based Rate Authorization, Docket No. ER96-496-010, et al., September 27, 2004, Revised December 9, 2004.

Before the Connecticut Siting Board, Prepared Testimony on Behalf of Connecticut Light and Power in support of its Application for a Certificate of Environmental Compatibility and Public Need for the construction of a 345-kV electric transmission line and reconstruction of an existing 115-kV electric transmission line between Connecticut Light and Power Company's Plumtree Substation in Bethel, through the Towns of Redding, Weston, and Wilton, and to Norwalk Substation in Norwalk, Connecticut, Docket No. 217, November 2004.

Before the FERC, Prepared Affidavit on Behalf of Otter Tail Power Company (OTP) Regarding Problems that May Result from the Implementation of MISO's Markets Tariff in OTP's Region, Docket No. ER04-691-000, May 7, 2004.

Before the FERC, Prepared Joint Affidavit with Judy W. Chang on Behalf of Devon Power LLC, et al., Docket No. ER03-563-030, March 24, 2004.

Before the FERC, Prepared Direct Testimony on Behalf of the California Parties with Regard to Enron's Circular Scheduling and Paper Trading Gaming Practices, Docket No. EL03-180-000, February 27, 2004.

Before the Commonwealth of Massachusetts, Prepared Expert Report on Behalf of Alstom Corporation and Black and Veatch vs. Meriden Corporation, LLC, Review of *"Value of the Meriden Power Project,"* Case No. 99-6016, January 9, 2004.

Before the FERC, Prepared Declaration on Behalf of The California Parties, Re: Gaming Activities Of Modesto Irrigation District, Docket No. EL03-159-000, October 2003.

Before the FERC, Prepared Affidavit on Behalf of Otter Tail Power Company For Otter Tail Power Company, Assessing how the Midwest ISO's Proposed Transmission and Energy Market Tariff will Affect Otter Tail Power both Operationally and Financially, Docket No. ER03-118-000, September 15, 2003.

Before the Pennsylvania Environmental Hearing Board, Prepared Expert Report on Behalf of Pennsylvania Power and Light, New Jersey Department of Environmental Protection vs. Pennsylvania Department of Environmental Protection and Lower Mount Bethel Energy, LLC, Docket No. 2001-280-C, May 2, 2003.

Before the FERC, Prepared Rebuttal Testimony on Behalf of Southern California Edison for the California Parties Regarding Manipulation of Energy and Ancillary Service Market Prices and the Outage Behavior of Gas-Fired Power Plants, Docket No. EL00-95-069, March 20, 2003.

Before the FERC, Prepared Testimony on Behalf of Southern California Edison for the California Parties Regarding Manipulation of Energy and Ancillary Service Market Prices and the Outage Behavior of Gas-Fired Power Plants, Docket No. EL00-95-069, February 24, 2003.

Before Southern District Court of Illinois, Prepared Expert Report for Department of Justice, Environmental Protection Agency vs. Illinois Power Company and Dynegy Midwest Generation Regarding the Likely Rate Treatment of Pollution Control Equipment Expenditures, Docket No.99-833-MBR, July 29, 2002.

Before the FERC, Prepared Direct Testimony on Behalf of Edison Mission Energy and Edison Mission Marketing and Trading, Inc. on Behalf of Midwest Generation's Application for Market-based Rate Authority, Docket No. ER99-3693-000, April 1, 2002.

Before the FERC, Prepared Rebuttal Testimony on Behalf of NSTAR on the Appropriate Rates for Generators During Transmission Upgrades or Enhancements Requiring Substantial and Sustained Reduction in Transfer Capability, Docket No. ER01-890-000, September 21, 2001.

Before the FERC, Prepared Affidavit on Behalf of NSTAR, in its Intervention of the Granting of Market-based Rate Authority to Sithe, Docket No. EL01-79-000, May 2001.

Before the FERC and the Public Utilities Commission of Nevada, Prepared Affidavit on Behalf of Sierra Pacific Resources Company, Regarding the Market Power Implication of Generation Asset Divestiture Required for the Merger of Sierra Pacific Power and Nevada Power Company, Docket No. EC0-173-000, February 23, 2001.

Before the California Energy Commission, Prepared Expert Report on Behalf of Calpine Corporation, Socioeconomic Resources: Economic Benefits of the Metcalf Energy Center, October 27, 2000.

Before the FERC, Prepared Affidavit on Behalf of NSTAR with regard to the Necessity of Imposing Bid Caps on the New England Electricity Market, Docket No. EL00-83-000, June 23, 2000.

Before the FERC, Prepared Direct Testimony on Behalf of Nevada Power Company in Support of the Divestiture of its Generation Assets, Docket No. ER99-2338-001, June 24, 1999.

Before the FERC, Prepared Direct Testimony on Behalf of Nevada Power Company in Support of the Divestiture of its Generation Assets, Docket No. ER99-2338-001, March 30, 1999.

Before the Vermont Public Service Board, Prepared Rebuttal Testimony on Behalf of Central Vermont Public Service Corporation on the Impact of its Demand-side Management Programs, Docket No. 6018, April 10, 1998.

Before the New Mexico Public Utility Commission, Prepared Direct Testimony on Behalf of the Public Service Company of New Mexico Regarding Forecasted Growth of the El Paso and Juarez, Mexico Markets, Case No. 2769, 1997.

Before the FERC, Prepared Affidavit on Behalf of Southern California Edison Describing the Implications for the Electricity Market of the Manipulation of Gas Market Prices, Docket No. RP95-363-015, 1996.

Before the Public Service Commission of Wisconsin, Prepared Direct Testimony on Behalf of Investor-owned Utilities of Wisconsin on the Utilities Cost of Capital, Docket No. 05-EP-7, May 8, 1995.

PROFESSIONAL AFFILIATIONS

Association of Energy Service Professionals, Board Member 1991-1995

Journal of A.DSMP., Editor 1995

American Statistical Association 1974-current

Member of A.S.A. Committee on Energy Statistics 1993-1999

Conseil International des Grands Reseaux Electriques (C.I.G.R.E.) 2005-2019

Working Group C5-8, Working Group on Renewables and

Energy Efficiency in a Deregulated Market 2008-2009

Institute of Electrical and Electronics Engineers (IEEE) 1986-current

International Association for Energy Economics 1986-current

ACADEMIC HONORS AND FELLOWSHIPS

Teaching Incentive Award, University of the Pacific 1979

Teaching Assistantship in Econometrics, Columbia University 1974

National Science Foundation Research Traineeship 1972 – 1974

Undergraduate and Graduate Research Assistantships, Florida State University — 1968 – 1972

Omicron Delta Epsilon, Economics Honor Society — 1971

PUBLICATIONS

"A Brief Comment on 'Percent Change as a Measure of Price Escalation in Water and Energy Utilities' by Jordi Honey-Rosés and Claudio Pareja" Journal of Public Works Management and Policy, (October 2019).

"Re-evaluating the implied Cost of CO_2 by clean energy investments," (with Mariko Geronimo and Onur Aydin) *The Electricity Journal* 30 (2017) 17-22.

"The Practicality of Distributed PV-Battery Systems to Reduce Household Grid Reliance," (with Roger Lueken, Will Gorman, and James Mashal), *Utilities Policy,* 2017.

"The Repurposed Distribution Utility: Roadmaps to Getting there," with Kai E. Van Horn, in *Future Utilities - Utilities of the Future*. F. P. Sioshansi, ed. (New York, Academic Press, 2016)

"The Next Evolution of the Distribution Utility," with Kai E. Van Horn in *Distributed Generation and its Implications for the Utility Industry*, F. P. Sioshansi, ed. (New York: Academic Press, 2014.)

"Annual Report on Wholesale Market Prices and Trends in the Metropolitan Edison Company, Pennsylvania Electric Company, Pennsylvania Power Company and West Penn Power Company Service Area" (with Mariko Geronimo Aydin), prepared for Met-Ed, Penelec, Penn Power and West Penn Power, November 2015.

"Reducing Utility Rate Shocks," (with Lawrence Kolbe), *Public Utilities Fortnightly*, June 2013.

"Redefining Normal Temperatures," (with Robert E. Livezey), *Public Utilities Fortnightly*, May 2013.

"Rates, Reliability, and Region: Customer satisfaction and electric utilities," (with William P. Zarakas and Kent Diep), *Public Utilities Fortnightly*, January 2013.

"What Price, GHGs?: Calculating the implied value of CO2 abatement in green energy policies," (with Mariko Geronimo), *Public Utilities Fortnightly*, Volume 150, October 2012.

"Rate Design by Objective: A purposeful approach to setting energy prices," *Public Utilities Fortnightly*, September 2012.

"State Regulatory Hurdles to Utility Environmental Compliance," *The Electricity Journal*, Vol. 25, Issue 3, April 2012.

"Riding the Wave: Using Demand Response for Integrating Intermittent Resources," (with Kamen Madjarov, Warren Katzenstein, and Judy Chang in *Smart Grid: Integrating Renewable, Distributed and Efficient Energy*, F.P. Sioshansi, ed. (New York: Academic Press, 2011).

"Marginal Cost Analysis in Evolving Power Markets: The Foundation of Innovative Pricing, Energy Efficiency Programs, and Net Metering Rates," (with Metin Celebi), *The Brattle Group, Inc. 2010 No. 2 (Energy)*.

"Assessing Ontario's Regulated Price Plan: A White Paper," (with Ahmad Faruqui, Ryan Hledik and Jenny Palmer), *The Brattle Group, Inc.*, December 8, 2010.

"On Dynamic Prices: A Clash of Beliefs?," *The Electricity Journal*, Vol. 23, Issue 6, July 2010.

"Virtual Bidding: The Good, the Bad and the Ugly," (with Metin Celebi and Attila Hajos), *The Electricity Journal*, Vol. 23, Issue 5, June 2010.

"Utility Supply Portfolio Diversity Requirements," (with Frank Graves), *The Electricity Journal*, Vol. 20, Issue 5, June 2007.

"Electric Utility Automatic Adjustment Clauses Revisited: Why They Are Needed More Than Ever," (with Frank Graves and Greg Basheda), *The Electricity Journal*, Vol. 20, Issue 5, June 2007.

"Rate Shock Relief," (with Frank Graves and Greg Basheda), *Electric Perspectives*, May/June 2007.

"Rate Shock Mitigation," (with Frank Graves and Greg Basheda), prepared for Edison Electric Institute, May 2007.

"Electric Utility Automatic Adjustment Clauses: Benefits and Design Considerations," (with Frank Graves and Greg Basheda), Edison Electric Institute, August 2006.

"Can Wind Work In An LMP Market?" (with Serena Hesmondhalgh and Dan Harris), *Natural Gas & Electricity*, November 2005.

"The CAISO'S Physical Validation Settlement Service: A Useful Tool for All LMP-Based Markets," (with Jared des Rosiers, Metin Celebi, Joseph Wharton), *The Electricity Journal*, September 2005.

"LMPs/FTRs Alone Will Not Solve Transmission Problems Blackout Showed," *Natural Gas and Electricity,* Volume 20, Number 4, November 2003.

"A Summary of FERC's Standard Market Design N.O.P.R.," Edison Electric Institute, August 2002.

"The Design of Tests for Horizontal Market Power in Market-Based Rate Proceedings" (with James Bohn and Metin Celebi), *The Electricity Journal*, May 2002.

"The State of Performance-Based Regulation in the US Electric Industry" (with David Sappington, Johannes Pfeifenberger, and Greg Basheda), *The Electricity Journal*, October 2001.

"Deregulation and Monitoring of Electric Power Markets" (with Robert Earle and James Reitzes), *The Electricity Journal*, October 2000.

"Shortening the N.Y.I.S.O.'s Installed Capacity Procurement Period: Assessment of Reliability Impacts," N.Y.I.S.O., May 2000.

"PJM Market Competition Evaluation White Paper," (with Frank Graves), prepared for PJM, LLC, October 1998.

"Lessons from the First Year of Competition in the California Electricity Market" (with Robert Earle, W.C. Johnson, and James Reitzes), *The Electricity Journal*, October 1999.

Comments to the FERC concerning Regional Transmission Organizations Notice of Proposed Rule Making, RM99-2, (with Peter Fox-Penner), September 17, 1999.

"In What Shape is Your ISO?" (with Johannes Pfeifenberger, Greg Basheda and Peter Fox-Penner), *The Electricity Journal*, Vol. 11, No. 6, July 1998.

"What's in the Cards for Distributed Resources?," (with Johannes Pfeifenberger and Paul Ammann), in Special Issue of *The Energy Journal*, *Distributed Resources: Towards a New Paradigm of the Electricity Business*, January 1998.

"One-Part Markets for Electric Power: Ensuring the Benefits of Competition," (with Frank Graves, E.G. Read, and Robert Earle), in *Power Systems Restructuring: Engineering and Economics*, ed. M. Ilic, F. Galiana, and L. Fink, Boston, MA: Kluwer Academic Publishers, 1998.

"Insurance Recovery for Manufactured Gas Plant Liabilities," (with Gayle Koch and Kenneth Wise), *Public Utilities Fortnightly*, April 1997.

"Real-Time Pricing - Restructuring's Big Bang?" (with Joseph Wharton and Peter Fox-Penner), *Public Utilities Fortnightly*, March 1997.

"Reengineering DSM: Opportunities Through Integration and Information" (with Wade Malcolm and Roger Levy) *Electricity Journal*, (November 1993)

"Load Impact of Interruptible and Curtailable Rate Programs," (with D.W. Caves, J.A Herriges, and R.J. Windle), *IEEE Transactions on Power Systems*, Vol. 3, No. 4, November 1988.

"Estimating Hourly Electric Load with Generalized Least Squares Procedures," (With N. Toyama and C.K. Woo.), *The Energy Journal*, April 1986.

"Transfer Function Estimation Using T.A.R.I.M.A.," *S.A.S. User's Group International*, 1982 Proceedings, Cary, North Carolina: S.A.S. Institute, Inc., 1982.

"Invited Editorial Response to Behavioral Community Psychology: Integrations and Commitments," by Richard Winett, *The Behavior Therapist 4(5)*, Convention, 1981.

Statistics Through Laboratory Experiences, (with D. Christianson and D. Hughes), Stockton, CA: University of the Pacific 1976-1977.

"Unsolved Advanced Problem," *American Mathematical Monthly*, May 1975.

"Introduction to Multivariate Data Analysis Techniques," Bureau of Applied Social Research, Columbia University, New York, NY, 1973.

Ten EPRI reports and approximately 20 articles in EPRI Reports and Conference Proceedings including:

Environmental Externalities: An Overview of Theory and Practice

Environmental Impacts of Electric Technologies

Environmental Impacts of Electric Vans (TEVan) in the Los Angeles Air Basin (South Coast Air Quality Management District)

Technical Assessment Guide (T.A.G.), Vol.4: Cost-Benefit Analysis of End-Use Technologies

Impact and Process Assessment of Energy Efficiency Technologies

Innovative Rate Design

Integrated Value-based Resource Planning

SELECTED PRESENTATIONS

"The Impact of Global Warming on Electric Utility Operations," National Climate Data Center, National Oceanic and Atmospheric Administration Conference on "The New Weather Normals," Asheville, North Carolina, November 2016

"Smart E.D.U.: Smart Technology, Smart Data, Smart Prices," S.G.I.P. Inaugural Conference Progress through Collaboration, Palm Beach Gardens, Florida, November 6, 2013.

"Customer-Facing Developments of the Smart Grid," (with Ahmad Faruqui and Sanem Sergici), Massachusetts Department of Public Utilities Electric Grid Modernization Workshop, Boston, Massachusetts, November 14, 2012.

"The Midwest ISO Capacity Market: Wither It Goest," Bruder, Gentile & Marcoux's 18th Annual FERC Briefing Midwest Edition, Chicago, Illinois, October 23, 2012.

"ISO Markets, Operations and Settlements," S.N.L. Inside Utility Accounting Program, Charlotte, North Carolina, October 17, 2012.

"Revenue Sources," S.N.L. Inside Utility Accounting Program, Charlotte, North Carolina, October 16, 2012.

"Impact of US L.N.G. on International Gas Prices," E.I.A. International Natural Gas Workshop, Washington, DC, August 23, 2012.

"Framework for Assessing Capex and Opex Forecasts as Part of a "Building Blocks" Approach to Revenue/Price Determinations," (with Paul R. Carpenter, Toby Brown, and Pinar Bagci), Australian Energy Market Commission, June 2012.

"Policy Challenges Associated with Renewable Energy Integration," 2011 M.I.T.E.I. Symposium: Managing Large-Scale Penetration of Intermittent Renewables (with Judy Chang, Kamen Madjarov and Peter Fox-Penner).

"Renewable Integration Model Presentation," (with Judy Chang), California Public Utilities Commission (C.P.U.C.) California Long-Term Procurement Plan Workshop, San Francisco, California, August 25, 2010.

"Renewable Integration Model and Analysis," (with Judy Chang, Kamen Madjarov, Ross Baldick, and Antonio Alvarez), IEEE 2010 Transmission and Distribution Conference and Exposition, New Orleans, Louisiana, April 21, 2010.

"Wire We Here? Coal in the West," Law Seminars International, Coal in the West Conference, Denver, Colorado, March 30, 2007.

"Does S.M.D. Need a New Generation of Market Models? Or How I Learned to Stop Worrying and Enjoy Carrying a Pocket Protector," S.M.D. Conference, Washington, D.C., December 5, 2002.

"Standard Market Design in the Electric Market: Some Cautionary Thoughts," S.M.D. Conference, May 10, 2002, Chicago, Illinois.

"Multiattribute Utility Theory and Earthquake Mitigation Policy," (with T. Munroe), Western Economic Association Conference, June 1978.

EXHIBIT "PH2"

This is a copy of the document marked Exhibit "PH2" mentioned and referred to in paragraph 5 in the said Affidavit of Dr. Philip Q Hanser.

Review of the Clean Energy Transition Rider

ENABLING THE 100/100 VISION

PREPARED FOR

THE BARBADOS LIGHT & POWER COMPANY LIMITED

PREPARED BY

Pearl Donohoo-Vallett

Philip Q Hanser

T. Bruce Tsuchida

THE Brattle GROUP

Table of Contents

I. Executive Summary

1. Achieving the 100/100 Vision will require a transformation of Barbados' electricity industry, replacing more than 90% of its existing generation with new clean, renewable resources. This transformation will need more than 600 MW of new clean energy and storage to replace the 300 MW of existing fossil generation.[1] One such portfolio includes 205 MW of centralized solar, 105 MW of distributed solar, 150 MW of onshore wind, 150 MW of offshore wind, 15 MW of biomass and waste-to-energy, and 200 MW of energy storage.[2] As these resources will likely be dispersed across the island, the transmission and distribution networks must be modernized to enable new flow patterns. This modernization includes new hardware and sensors to allow two-way flow from distributed resources and communication devices to control the increased number of resources.

2. The 100/100 Vision will place Barbados on the cutting edge of de-carbonization, and the Barbados Light and Power Company (the BLPC) will be a crucial partner in transforming the island electricity industry while continuing to provide safe and reliable service. To lay the groundwork for the 100/100 Vision, the BLPC has developed a bridging plan, the Clean Energy Transition Program (CETP)—a 5-year investment plan (2020-2024). The CETP includes the Clean Energy Resiliency Bridge, renewable generation (including a 10 MW wind farm at Lamberts St. Lucy and an additional 15 MW solar PV plant), energy storage, and grid modernization expenses.

3. The increased capital investments required to enable the 100/100 Vision represent a marked departure from business as usual and merit consideration of adapting the current regulatory environment to allow for timely recovery of investments and efficient customer price signals. The BLPC anticipates the first phase of electricity sector investments in the CETP will cost over $270 million, in addition to the sustaining capital required for normal

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[1] Ministry of Energy and Water Resources, "Barbados National Energy Policy 2019-2030," http://energy.gov.bb/web/national-energy-policy-for-barbados-2019-2030

[2] *Id.*

system investments. To make these and other ongoing investments that enable the initial transition towards 100/100 Vision, the BLPC faces issues including:[3]

- **Timely recovery** of capital investments needed to transition towards the 100/100 Vision
- **Stranded assets** as investments needed today to transition towards the 100/100 Vision may become obsolete due to system evolution
- **Increased system operating expenses** due to increased flexibility needs (i.e., ancillary services, quick starts, cycling etc.) to accommodate the variable outputs of renewable resources

4. Given the need for these investments to enable the transition towards 100/100 Vision, the near term impacts related to the timely recovery of capital investments require the most immediate attention.

5. Without an adjustment to its regulatory environment, the BLPC represents that it will not be able to make the investments supporting the 100/100 Vision while maintaining a reasonable opportunity to earn its regulated return on equity, due to regulatory lag. Regulatory lag is the time between when expenditures are made and when the utility recovers the revenue requirement for the expenditures.[4] In this case, the regulatory lag between 100/100 Vision investments and recovery would likely cause the BLPC to under-earn relative to its allowed return on equity (AROE) because the utility would be unable to add the investments to its rate base promptly. Without a change in its regulatory environment, the BLPC estimates that its actual return on rate base would be 5.42% in 2020 (relative to a 10% allowed rate of return) and decrease further to -0.89% in 2024. Furthermore, the requirement for the BLPC to finance a capital campaign would likely impair the utility's liquidity due to substantial outflows of capital before recovery.

6. The primary mechanisms available to the BLPC to support increases in investment today are rate case filings requesting higher base rates. To keep up with the 100/100 Vision

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[3] If the BLPC is responsible for resource adequacy in the local market, then the BLPC would further be required to supplement (or replace) third-party generation that may become unavailable. This may include independent power producer that exits the system with insufficient notice or projects that are delayed in coming on line.

[4] In other situations, regulatory lag can provide an incentive for utilities to be fiscally efficient as the utility must absorb any increases in costs between rate cases and cause the utility to under-earn relative to its allowed return on equity (AROE). If the overall expenses are increasing at a lower rate than revenues (i.e., the utility's revenues are outpacing expenditures), then regulatory lag can benefit the utility and the utility could over-earn relative to its AROE.

investment needs and its changing rate base, the BLPC anticipates filing annual general rate cases. These would strain the resources of the Fair Trading Commission (FTC) and the BLPC. Historically, the BLPC's base rate cases have been infrequent due to the financial health of the BLPC and the regulatory burden associated with filing rate cases. An annual rate case filing would require that the BLPC prepare, and parties review, updates to the cost of service model, rate design, and cost of capital, in addition to changes in capital expenditures and operations and maintenance. To avoid this regulatory burden for fuel costs, the Fuel Clause Adjustment (FCA), which allows the BLPC to pass through fuel costs without requiring a general rate case to adjust base rates, was developed. The FCA focuses on a narrow scope to support the pass-through of fuel costs, not a major multi-faceted capital campaign that requires the development of forward-looking plans and review. Therefore, neither of the two primary regulatory mechanisms available and in place today to the BLPC is structured to accommodate an expansion in the capital program.

7. The BLPC is proposing a capital rider, the Clean Energy Transition Rider (CETR), as an alternative mechanism to allow timely recovery for expenditures related to the 100/100 Vision, initially focused on the CETP. Before inclusion in the tracker, these investments would need approval by the relevant regulatory authorities, and the CETR would address the revenue requirement for the assets, including financing. The BLPC proposes to file annual adjustments to the CETR on March 1 with rate adjustments beginning approximately 90 days later on June 1. These yearly adjustments would include assets that are in service as of March 1. When BLPC files a general rate case, the non-depreciated portion of assets will transition from the rider to the rate base.

8. The BLPC estimates that the CETP investments will likely result in minimal customer bill impacts and has proposed additional customer protection. Specifically, the BLPC estimates that reduction in fuel costs will offset CETP investments through 2025. To provide further protection to customers, the BLPC has proposed that in the event the CETR adjustment is higher than the fuel cost avoided, the FTC may consider a cap on annual rate increases. To balance customer protection with the BLPC's need to recover its investments, any costs not included in the rider due to a yearly cap would be deferred and recovered in subsequent years.

9. The remainder of this memo follows in four sections. Section II provides an overview of trackers and riders, including design components and typical applications. Section III reviews balancing objectives in capital tracker designs. Section IV reviews the BLPC's

proposed CETR, and Section V provides concluding remarks. The Appendix contains examples of capital riders and trackers in the United States.

II. Overview of Trackers

10. Trackers supplement traditional utility regulation by allowing utilities to recover pre-specified costs or categories of expenses outside of a general rate case. A general rate case requires regulators, stakeholders, and utilities to grapple with a wide range of issues, including the revenue requirement, rate design, and cost of capital. By avoiding a full rate case, trackers (and riders, these terms are used interchangeably here) can streamline the regulatory process and focus on a more narrowly defined subject. The streamlined regulatory process reduces regulatory burden and allows for more timely decision making and revenue recovery. For example, a fuel adjustment clause that allows the utility to adjust the utility bill based on its incurred fuel cost (sometimes adjusted against the prevailing market price of fuel) used for its generation, is a well-known tracker. Since a tracker's review is narrower than a general rate case, it is typically more expedited than a full rate case. This shorter review timeline increases the importance of clearly articulating the tracker's specifications and all parties – regulator, stakeholders, and utility – agreeing to them in the initial design. This Section begins by describing four critical components of trackers (in Section II.A) followed by a review of typical applications (in Section II.B).

A. Tracker Design Components

11. As summarized in Figure 1, a tracker's design usually consists of four core components: 1) scope; 2) approval process; 3) performance incentives; and 4) cost containment. Each element should be specified in sufficient detail during the tracker's design phase to avoid subsequent lengthy regulatory processes following the tracker's approval. Failing to do so potentially increases the regulatory burden, thus reducing the tracker's goal of process efficiency improvements in comparison to a full rate case. The components outlined in Figure 1 are discussed individually in the following subsections.

Figure 1: Tracker Design Components

Component	Specifications	Indicative Examples
Scope	Types of capital and O&M costs includable in the tracker	• Fuel costs • Utility-installed solar capital costs • Targeted distribution system upgrades • Construction work in progress
Approval Process	Method and timing of tracker expenses	• Annual pre-approval of program budgets • Annual ex-post approval of expenditures • Quarterly pre-approval of specific expenditures
Performance Incentives	Rewards/penalties for over/underperformance on budget or timeline	• Basis point reward for coming in under budget • Penalty for delayed implementation
Cost Containment	Limits on tracker recovery	• Rate increases limited to a certain percentage per year • Disallowances of costs above budget

1. Scope

12. The scope defines the types of costs that a utility may include in the tracker's cost recovery. A tracker's scope may be broad and include multiple types of expenditures (e.g., grid modernization) or narrow and limited to a single project or investment type (e.g., installation of advanced metering infrastructure). Similarly, a tracker can be designed for ongoing use (e.g., a fuel adjustment clause) or designed to end following completion of a pre-specified project or period (e.g., construction of a generating station's scrubber). As in typical utility revenue requirement calculations, trackers may be designed to recover some combination of capital costs, O&M costs and construction-related costs (i.e., construction work in progress (CWIP) or allowance for funds used during construction (AFUDC)).

13. Broadly scoped trackers, which are inclusive of multiple project types, can provide regulators and utilities flexibility to implement complementary initiatives under a single umbrella. Under a broad tracker, the utility can have the flexibility to substitute more efficient or valuable investments than the one(s) original scoped without the need to develop a new regulatory mechanism. This can ease the regulatory burden relative to managing multiple trackers.[5] The flexibility of broad trackers can be especially

[5] This presumes that the regulator would approve the proposed substitute expenditures.

advantageous in circumstances where the required investments are heterogeneous, uncertain, or not well-defined initially.

14. By contrast, narrowly scoped trackers are less flexible from an investment perspective but may provide greater transparency to the extent that only well-defined expenditures are included. If the expenditures for a tracker are targeted in nature (e.g., fuel costs), then the review of expenditures is more straightforward. This narrow approach and concomitant transparency can provide customer protection by removing uncertainty concerning allowable expenditures. The trade-off for this transparency is the potential requirement for a range of trackers to achieve similar objectives. Rather than passing through multiple projects or types of projects through a single broad tracker, the regulator may need to authorize a unique tracker for each specific expenditure category.

15. Trackers that involve capital expenditures may include provisions for outlays during construction through CWIP or AFUDC. If a tracker allows the utility to recover CWIP, then the utility can seek recovery for expenditures before a capital investment comes into use. CWIP provides the utility with increased cash flows during the investment period and can act as a further incentive for the company to invest capital. Some jurisdictions do not permit the use of CWIP as expenditures are recoverable only when the asset is deemed "used and useful." CWIP can be viewed as reducing the prudency review of expenses as outlays are recovered before such a review. As an alternative, AFUDC allows for the recovery of financing costs during construction, but the recovery of those costs does not take place until after the asset is in service. The relative value to the utility of using CWIP or AFUDC depends on the size of the capital investment and the length of the construction period.[6]

2. Approval Process

16. Trackers typically have multiple approval levels, ranging from the approval of the tracker itself to prudency reviews of individual investments following the asset placement into service. Unlike typical utility expenditures or capital investments that are reviewed during a general rate case, the review of tracker expenditures is primarily dealt with outside the

[6] Typically, higher value is associated with larger projects and longer construction periods.

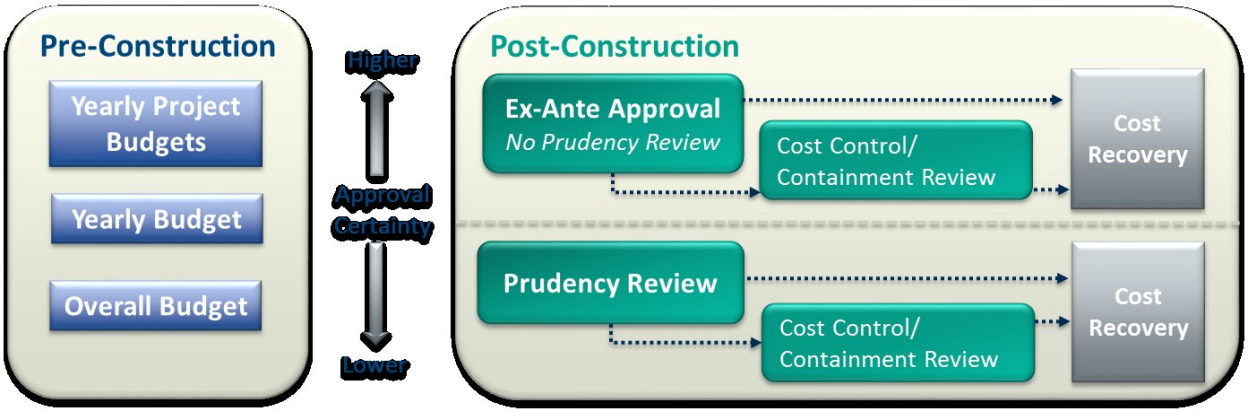
rate case process. The approval process can be viewed as comprising two stages: pre-expenditure and post-expenditure.

17. The pre-expenditure approval process can include approval of an overall (multi-year) budget, an annual budget, or budgets for specific projects to be recovered through the tracker. These pre-approval processes can also be combined. For example, an overall multi-year tracker budget approval could be paired with the subsequent approval of individual projects. More in-depth pre-approval processes provide greater certainty for customers and regulators on specific projects and their anticipated costs and give the utility greater confidence that expenditures will be treated as prudent.

18. The post-expenditure review can include prudency reviews or more formulaic audits or checks to see that the expenditures matched what was previously approved. These post-expenditure reviews can occur monthly, quarterly, or annually depending on the timing and magnitude of the expenditure within the tracker. The timing of the reviews should account for the likely investment or implementation schedule. For example, a monthly report of expenditures for a tracker related to the undergrounding of distribution lines may increase regulatory burdens without providing value as the undergrounding investments may take many months to make reviewable progress.

19. By shifting the amount of approval that takes place between pre- and post-construction approval, regulatory commissions can influence the relative risk of the investments, as illustrated in Figure 2. The more likely that the expenditures will be approved, the greater the utility's incentive to make those investments.

Figure 2: Pre- and Post-Expenditure Approval Processes



3. Performance Incentives

20. Performance incentives can be added to a tracker to incentivize cost-effective expenditures more forcefully and to deliver projects on or ahead of schedule. One critique of trackers is that with a pre-approved budget and without the customary regulatory lag between investments and recovery,[7] utilities lack incentives to make the most efficient expenditures. To counter these incentives, regulators can add performance incentives, such as modifications to the AROE and sharing of savings relative to the budget (i.e., the difference between the budgeted and actual expenditures). These incentives should only be applied to the extent that the utility has reasonable influence over the relevant expenses. If incentives are assigned to costs mostly out of the utility's control, such as purchased fuel, then the utility may earn rewards or receive penalties without changing its behaviour.

4. Cost Containment

21. The use of additional cost containment measures can mitigate cost overrun risks and, in combination with the approval processes, counteract the concern that trackers can act as a "blank check" to utilities. Cost containment measures related to approved project budgets include: 1) requiring any expenditures above the budget be subject to regulatory lag and considered in the next rate case; 2) sharing of expenditures above the budget between the utility and customers; and 3) disallowing from cost recovery all costs above the approved budget. For trackers with less project-specific budget certainty, cost containment can also be implemented through a cap on total expenditures or, equivalently, a cap on the rate impact (e.g., limit the year-over-year rate increase due to the tracker).

22. Cost containment mechanisms should take into account the relative certainty of the budget and the potential effect of stringent cost-containment approaches (e.g., disallowing cost recovery for expenditures above the budget) to delay utility investments to avoid disallowances. If the costs of a project are uncertain, the utility may slow its investment schedule to ensure that it remains at or below budget. Although in some circumstances,

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[7] Regulatory lag is the time between when expenditures are made and when the utility recovers the revenue requirement for the expenditures. Regulatory lag can provide an incentive for utilities to be fiscally efficient as the utility must absorb any increases in costs between rate cases and cause the utility to under-earn relative to its AROE. However, if the overall revenue expenditure is increasing at a lower rate than revenues (i.e., the utility's revenues are outpacing expenditures), then regulatory lag can benefit the utility and the utility could over-earn relative to its AROE.

this may be the desired outcome, in others, the regulator values the speed of investment. As with performance incentive mechanisms, cost containment is most appropriate when the utility has control over the costs.

B. Typical Applications

23. Trackers are applied to a variety of utility expenditures, such as fuel, purchased power, and capital expenditures, including those for renewable generation, transmission and distribution upgrades, and advanced metering infrastructure. As shown in Figure 3, nearly all of the electric utilities in the United States have at least one tracker (107 of a total of 128 utilities sampled). Approximately half have at least one capital expenditure tracker (68 of 128 sampled) with infrastructure (transmission and distribution) being more prevalent than generation capacity trackers.

Figure 3: Summary of US Electric Utility Trackers/Riders by Type

Type of Tracker/Rider	Number of Utilities
Renewables expense	70
Electric fuel/gas commodity/purchased power	107
Environmental compliance	52
New Capital	
Generation capacity	26
Generic infrastructure	68

Sources: 2018 RRA Adjustment Clauses
Notes: Count based on a maximum of 128 US electric utilities.

24. A range of infrastructure and renewable trackers have been used in the United States that address broad investment programs to specific renewable generation facilities. Figure 4 lists a few of these trackers. For example, in Arkansas and California, trackers have been used for "smart grid" technologies, in Arkansas on a system-wide basis and in California on a pilot basis. In Indiana, Massachusetts, and Pennsylvania, more broad transmission and distribution trackers have been used for capital investments. Similarly, both narrowly focused and broad approaches have been used for renewable energy projects. The Minnesota renewables tracker allows for recovery of costs associated with any renewable resource built meeting the Renewable Energy Standard. In contrast, the New Jersey solar generation tracker only covers costs associated with solar generation, and the Oklahoma

Crossroads tracker only covers costs of a specific wind farm. The Appendix contains an inventory of over 140 capital trackers.

Figure 4: Sample of Renewable and T&D Trackers in the United States[8]

State	Utility	Tracker Name	Eligible Investments
AR	Oklahoma Gas & Electric	Smart Grid Rider	System-wide smart grid implementation
CA	Pacific Gas & Electric	Smart Grid Pilot Deployment Project Balancing Account	Pilot programs for smart grid line sensors, volt/VAR optimization, detection and location of distribution line outages and faulted circuits, and information technology investments to improve short term demand forecasting for power procurement
IN	Northern Indiana Public Service	Transmission, Distribution & Storage System Improvement Charge	Investments to maintain the capacity deliverability of system and replacement of ageing infrastructure, economic development
MA	NSTAR Electric	Capital Projects Scheduling List	Stray voltage inspection survey and remediation program; double pole inspections, replacements, and restorations; and maintenance hole inspection, repair, and upgrade
MN	Northern States Power (Xcel Energy)	Renewable Energy Standard Cost Recovery Rider	New renewable resources needed to meet Renewable Energy Standard
NJ	Public Service Electric and Gas	Solar Generation Investment Program	136 MW of utility-owned solar
OK	Oklahoma Gas & Electric	Crossroads Rider	Crossroads Wind Farm
PA	PECO	Distribution System Improvement Charge	Storm hardening and resiliency measures, underground cable replacement, substation retirements, and facility relocations

25. Since trackers remove expenditures from traditional regulatory frameworks, using trackers often requires justification. The National Regulatory Research Institute (NRRI) provides

[8] EEI, Alternative Regulation for Emergency Utility Challenges: 2015 Update, Table 2, p. 12-19;

Xcel Energy, Minnesota Rate Riders – Electric, available at: https://www.xcelenergy.com/staticfiles/xe/Regulatory/Regulatory%20PDFs/rates/MN/MinnesotaRateRiders.pdf;

State of New Jersey Board of Public Utilities, Order Approving Stipulation on Bilateral Sale Contract, available at: https://www.bpu.state.nj.us/bpu/pdf/boardorders/2011/20110518/5-16-11-8J.pdf;

three cost characteristics to justify a tracker: 1) largely outside the utility's control; 2) unpredictable and volatile; and 3) substantial and recurring such that "the difference between test-year costs and actual costs can materially affect a utility's rate of return."[9] While narrowly defining a tracker's scope to only those costs exogenously driven, "largely outside the utility's control" (e.g., fuel), it can be more broadly defined to include expenditures driven by policy requirements that are outside the utility's typical purview (e.g., environmental regulations).

26. Pragmatically, trackers are also used to induce utilities to make investments that would otherwise either not occur or occur on a slower timescale than the regulator prefers. Under a traditional ratemaking approach, when a utility undertakes a capital investment, it does not begin to recover its costs (or return) on the investment until included in the rate base through a general rate case process. A substantial capital investment or extended time lag between rate cases can lead to significant financial impacts on the utility. That is, the utility has a considerable outflow of expenditures with a concomitant increase in revenues that can affect cash flows and overall earnings. While regulatory lag can be considered appropriate in many circumstances, it can hinder the utility's ability to make investments that the policymakers would like to prioritize. Trackers, which allow for faster recovery, can induce utilities to make significant capital investments by minimizing the regulatory lag.

III. Balancing Objectives in Capital Tracker Designs

27. The design of trackers should reflect the underlying motivation while balancing the need for regulatory oversight with streamlined regulatory treatment and incentives to invest. For a tracker developed to enable capital investment, the approaches that lower hurdles for utility investment reduce regulatory oversight as well. For example, a tracker designed to maximize utility investment could allow pre-approval of expenditures, no ex-post

NJ PUC, Order for Docket No. EO12080721, available at: https://mseia.net/site/wp-content/uploads/2012/05/BPU-Board-Order-PSEG-Solar4All-Extension-5-29-13-2V.pdf.

9 National Regulatory Research Institute (K. Costello) "Alternative Rate Mechanisms and Their Compatibility with State Utility Commission Objectives," Report No. 14-03, April 2014.

prudency review, performance incentives related to delivering investments early, and no cost-containment measures. Such a tracker would not balance the incentives to invest with reasonable regulatory oversight. Instead, regulators balance the motivations for the utility to invest with the ability of regulators and stakeholders to assess the prudence of the utility's expenditures and its incentives to invest efficiently.

28. Two capital investment tracker examples from Pennsylvania and New Jersey illustrate the distinct balance between regulatory oversight and the streamlined regulatory process balance discussed above. In both cases, the weight of the project approval process is toward pre-approval. The Pennsylvania tracker requires more formulaic checks before adding the asset to the tracker for recovery. In contrast, the New Jersey tracker requires a final prudency review during the next rate case. Though structured differently, both trackers also include cost-containment provisions.

29. The Pennsylvania Distribution System Improvement Charge (DSIC) is a capital tracker program available to electric, natural gas, and water utilities. The DSIC was initiated to attract investment for an aged water system in 1996[10]. It has since been held as a model program and replicated in other states.[11] In the electric sector, six of eight Pennsylvania utilities use the DSIC tracker to recover costs. The utility must first create a five-year Long Term Infrastructure Investment Plan (LTIIP) to make use of the DSIC, which is subject to stakeholder scrutiny and must be approved by the Pennsylvania Public Utilities Commission (PA PUC). The LTIIP defines the budgets and projects that the utility is authorized to recover through the DSIC mechanism. Once the LTIIP is approved, the utility can invest up to 5% of distribution rates billed to customers through the tracker. The tracker was developed explicitly as a way to encourage investment. In the view of the PA PUC, if a utility is over-earning (relative to its allowed ROE), then the tracker is no longer required to incentivize the utility to invest and consequently, the tracker is removed.

30. The most recently approved LTIIP for PECO Energy Company includes a broad range of programs, including storm hardening, underground cable replacement, and facility

[10] PA PUC, PECO Long-Term Infrastructure Improvement Plan Opinion and Order, October 22, 2015.

[11] PA PUC, "System Improvement Charges Distribution and Collection."

relocations. The total budget for these electric programs over the five years is $320 million, mainly in capital investments.

Figure 5: Pennsylvania Distribution System Improvement Charge Summary[12]

Pennsylvania's Distribution System Improvement Charge (DSIC)	
Motivation	• Accelerate investment in new utility plant to replace ageing distribution infrastructure; • Recover fixed costs (depreciation and pre-tax return) of certain non-revenue producing, non-expense reducing infrastructure improvement costs placed into service between base rate cases; • Reduce the number of base rate cases and the associated expenses, resulting in a more gradual increase in rates for consumers; • Better absorb increases in other categories of costs for a more extended period, particularly during times of relatively low-interest rates; • Facilitate compliance with evolving regulatory requirements; and • Implement solutions to regional supply problems.
Scope	• Revenue neutral projects (e.g., no new customer interconnections or generation facilities), consisting principally of replacement investments.
Sample Included Projects	**PECO Energy Company – 2016-2020** 1) Storm Hardening and Resiliency Measures; 2) Underground Cable Replacement; 3) Building Substation Retirements; and 4) Facility Relocations. **Total budget:** $320 million ($270 million for reliability projects and $50 million for facility relocation).
Approval Process	• Approval of 5-year long-term infrastructure improvement plan (can be renewed) • Annual reconciliation of and hearing on recoverable costs and revenues • Audit to ensure money is spent only on DSIC-eligible projects
Performance Incentives	• None
Cost Containment	• Cap on rate increases due to rider, typically 5% • DSIC is removed if the utility is over-earning

31. In New Jersey, the Public Service Enterprise Group (PSEG) can recover up to $1 billion through the Energy Strong Rider, which was developed for recovery from five major storms (including two hurricanes and a snowstorm) and to increase the resilience of the

[12] PA PUC, System Improvement Charges Distribution and Collection, available at: http://www.puc.state.pa.us/general/consumer_ed/pdf/dsic_fs.pdf; PA PUC, Opinion and Order for Petition by PECO Energy Company for Approval of their Electric Distribution System Improvement Charge.

system to future storms.[13] As a broad tracker, the Energy Strong Rider includes flood mitigation and the installation of advanced communication technologies, among other measures. Unlike the DSIC program in Pennsylvania, which is renewable, the Energy Strong Rider was initially designed as a one-time, three-year investment program. The budget for the program was developed through a rate case process, and the total tracker budget across both electricity and gas is $1 billion. The investments are approved on a provisional basis and included in the tracker for recovery every six months. Final approval of the investments occurs during the next rate case. Investments over and above the $1 billion can be reviewed for recovery during the next rate case.

[13] The New Jersey Public Utilities Commission has also approved a second phase of the Energy Strong program. See https://www.njspotlight.com/2019/09/19-09-11-pse-gs-scaled-back-proposal-for-gas-and-power-grid-upgrades-is-approved/

Figure 6: New Jersey Energy Strong Rider Summary[14]

New Jersey's Energy Strong Rider	
Motivation	• Recovery from storm damage and reinforcing resiliency of the grid
Scope	• Recovery of revenue requirement based on net plant costs calculated on a semi-annual basis • Includes AFUDC, depreciation, income taxes • Excludes O&M related to capital investments
Sample Included Projects	**PSE&G Electricity** 1) Electric station flood mitigation (raise, relocate, or protect 29 switching and substations damaged by storms) 2) Advanced Technologies (deploy expanded system communication and data collection) 3) Create system redundancies through smart switches, fuses, and adding redundancies in distribution loop designs. **Total electric budget:** $820 million.
Approval Process	• First $1 billion of total investments (electric and natural gas) recovered through rider; remaining planned $220 million recovered through a rate case • Approval of eligible programs • Provisional approval and recovery of investments on a semi-annual basis • Review of all investments in the following rate case
Performance Incentives	• None
Cost Containment	• Cap on total investments recovered through the program • Time limited, 3-year program (excluding substation relocation which is a 5-year program)

IV. Review of the BLPC's Proposed CETR

32. The BLPC is proposing the Clean Energy Transition Rider (CETR) to aid implementation of the Government's 100/100 Vision through the Clean Energy Transition Program (CETP) and ongoing investment needs. The CETP includes new generation, storage, and transmission and distribution investments, and the BLPC anticipates that the first phase of

[14] PSEG, "PSE&G Reaches $1.22 Billion Settlement in Energy Strong Proceeding with NJ BPU Staff," May 1, 2014. Available at: https://investor.pseg.com/investor-news-and-events/financial-news/financial-news-details/2014/PSEG-Reaches-122-Billion-Settlement-in-Energy-Strong-Proceeding-with-NJ-BPU-Staff/default.aspx.

electricity sector investments to enable the 100/100 Vision will cost over $270 million through 2024. These investments include:

- **The Clean Energy Resiliency Bridge**, a 33 MW medium-speed diesel plant;
- **Renewable Generation Resources**, including the 10 MW wind farm under development at Lamberts, St. Lucy and an additional 15 MW solar PV plant;
- **Energy Storage**, such as the existing 5 MW Energy Storage Device and an additional 10 MW of batteries; and
- **Grid Modernization Investments,** including expanded voltage management tools, sensors, and automated controls in addition to the expansion of the communication network.

33. These investments aim at facilitating the transition towards the 100/100 Vision directly through new renewable resources as well as increased flexibility and enhanced capabilities to accommodate two-way power flows from distributed energy resources such as rooftop solar. However, this is only one of the multiple stages of investments needed to fully transition the Barbados electric system to the renewable goals described in the 100/100 Vision.

34. This Section first reviews components of the proposed CETR and compares the overall design of the proposed CETR to the DSIC and Energy Strong Rider discussed previously. The Section then compares the use of a tracker to other regulatory treatments of the anticipated expenditures related to the 100/100 Vision.

A. THE BLPC PROPOSED CETR DESIGN

35. As summarized in Figure 7, the BLPC has proposed a framework for the CETR that encompasses each of the core design elements and enables it to transition towards the Government's 100/100 Vision goal. The BLPC designed the tracker components to balance the significant investments required to support the transition towards Government's 100/100 Vision goal while recognizing the limited resources available to the FTC, stakeholders, and the BLPC.

Figure 7: Summary of the BLPC Proposed CETR

Component	Specifications
Scope	• Depreciation expense, tax expense, allowed return, and operation and maintenance associated with the CETP
Approval Process	• Approval of broad categories in the CETP • Approval of specific project budgets • Annual approval of expenditures for recovery • Investments added to rate base during next rate case
Performance Incentives	• None
Cost Containment	• CETR investments are anticipated to be offset by fuel cost savings. • If costs from the CETR exceed the fuel savings, the FTC may consider an annual rate increase cap, with revenues and appropriate interest delayed to subsequent years

36. The BLPC tracker's scope includes the revenue requirements associated with generation, power purchase contracts, transmission, and distribution investments associated with transitioning towards the clean energy vision goal. Because the CETR is broadly defined, over the long-run, it can help accommodate the range of potential investments required (including those beyond the CETP) to achieve the 100/100 Vision without the need for the creation and administration of unique trackers for each expenditure type. However, the broad definition could raise concerns that the BLPC could include all of its expenditures (related to the 100/100 Vision or not) into the tracker to avoid delay on recovery. The BLPC's proposed approval process mitigates these concerns through approval of the investment types that includable in the CETR and explicit approval of specific project budgets. These two pre-approvals provide the FTC opportunities to agree (or disagree) that the expenditures should be eligible for recovery through the proposed CETR and provide the BLPC greater certainty that the expenditures will be treated as prudent.

37. Concerning cost containment, the proposed CETR provides multiple levels of review and measures to ensure that the incurred costs are reasonable. First, as previously discussed, the CETR includes two opportunities for the FTC or stakeholders to review the expenditure types proposed and then specific project budgets. Second, the BLPC anticipates that the CETP investments, recovered through the CETR, will reduce fuel costs such that customers will not see significant bill impacts. Should the CETR expenses exceed the fuel cost offsets on an annual basis, the BLPC proposal contemplates an annual cap on rate increases due to the CETR. Expenditures above that cap would be recovered in subsequent years, including interest.

38. The CETR's structure is similar to the DSIC in Pennsylvania and the Energy Strong Rider in New Jersey, discussed earlier in Section II and shown in Figure 8 below. All three trackers allow *broad* categories of costs to be recovered through the tracker. Similarly, all three require *pre-approval* of plans and budgets, including an annual (or semi-annual) review of expenditures before recovery. The DSIC mechanism requires less regulatory review than the proposed CETR or Energy Strong Rider with an audit to affirm that expenditure matched allowed projects rather than consideration of the projects themselves. None of the three trackers include *performance incentives*, and all three provide *cost-containment* mechanisms, predominantly through pre-approved budgets. Both the DSIC and the proposed CETR also contemplate *caps* on the amount that the tracker expenditures can affect customer base rates.

Figure 8: Comparison of CETP, Energy Strong, and DSIC Trackers

	CETP (Proposed)	Energy Strong, NJ	DSIC, PA
Scope	Broad	Broad	Broad
Approval	• Approval of broad categories and approval of the CETP • Approval of specific project budgets • Annual approval of expenditures for recovery • Investments added to rate base during next rate case	• Approval of eligible programs • Provisional approval and recovery of investments on a semi-annual basis • Review of all investments in the following rate case	• Approval of 5-year plan (can be renewed) • Annual reconciliation of and hearing on recoverable costs and revenues • Audit to ensure money is spent only on eligible projects
Performance Incentives	None	None	None
Cost Containment	• CETR investments are anticipated to be offset by fuel-cost savings. If costs from the CETR exceed the fuel savings, the FTC may consider an annual rate increase cap, with revenues and appropriate interest delayed to subsequent years	• Cap on total investments recovered through the program • Time limited program	• Cap on rate increases due to rider, typically 5% • DSIC is removed if the utility is over-earning

B. Other Regulatory Mechanisms to Enable 100/100 Investments

39. Three main factors characterize the operating environment for the 100/100 Vision investments: 1) the need for significant investments to enable the 100/100 Vision; 2) the constrained regulatory and utility resources; and 3) the considerable uncertainty associated with the technology, cost, and timing of 100/100 Vision investments. The investments needed to get to 100/100 Vision are also a single issue, to the extent that the BLPC does not need to resolve cost allocation, rate design, or the cost of capital issues on the same timeline as the need to invest.

40. Although utilities are typically incentivized to invest in order grow their rate base, the amount of investment that a utility is willing to undertake is limited by practical financial concerns, including regulatory lag. Utilities have responded to concerns of regulatory lag

by updating their revenue requirements through frequent rate cases, which impose substantial burdens on regulators, stakeholders and utilities. Historically, the BLPC has had widely spaced general rate cases, with the last rate case occurring in 2010. Alternatively, to enable utilities to invest while avoiding frequent rate cases, regulators have used a variety of adjuncts to traditional cost of service regulation. In addition to trackers, regulators have used: 1) future test years; 2) formula rate plans; and 3) multi-year rate plans with forecasted revenue requirements. Each of these regulatory approaches has strengths and weaknesses, and the selection of a regulatory approach is necessarily dependent upon the specific context of the jurisdiction.

41. Tailoring a regulatory approach to the BLPC will require collaboration between the BLPC and the FTC. However, based on a review of these alternative approaches, discussed one-by-one below and summarized in Figure 9, a tracker reasonably balances regulatory resource needs while enabling the required utility investments.

Figure 9: Relative Impact of Alternative Regulatory Approaches on Select Measures

	Decreased Regulatory Burden	Greater Investment Incentives	More Tailored to 100/100 Investments	Increased Regulatory Oversight
Tracker				
Annual Rate Cases	Worse	Lower	Lower	Higher
Future Test Year	Worse	Lower	Lower	Higher
Formula Rates	Worse	Same	Lower	Lower
Multi-Year Rate Plan *(stair-step)*	Worse	Same	Lower	Lower

Notes: These relative scorings are intended to provide a general and are not reflective of all possible design options, which can include different relative balancing of regulatory burden, oversight, and investment incentives.

1. Future (Forecasted) Test Years

42. Under a future test year, revenue requirement and rates for the upcoming rate period are calculated using projected costs and sales, rather than actual or historical values. By using a future test year, a utility can project investments for the next year and incorporate those expenditures into its revenue requirement. Typically, the first 12-months of the new rate period make up the forward test year. As a result, new rates should align well with the costs and sales during this period and mitigate any concerns due to the misalignment of revenue

collection and expenses, at least theoretically.[15] This approach also has the advantage of being transparent as stakeholders have an opportunity to review and examine projected investments, costs and sales before incurring the expenses.

43. Since BLPC anticipates varying annual expenditures over multiple years, a forecasted test year without an additional tracker may be insufficient for adequate cost recovery and result in the need for frequent rate cases. If the expenditures required to meet the 100/100 Vision goals increase over time, then the revenue requirement estimated for a forecasted test year may perennially lag the BLPC's actual incurred revenue requirement. The perennial lag, if significant, would result in the BLPC under-earning relative to its AROE and likely frequent rate cases. Unlike the forecasted test year approach, a tracker by its nature only captures incurred costs and mitigates the need for rate cases due to increased investments. The BLPC's current estimates result in an increasing rate base, indicating that the BLPC would experience regulatory lag and likely need to file frequent rate cases even with a forecasted test year.

2. Formula Rates

44. Formula rates refer to a regulatory mechanism through which rates are adjusted outside of a general rate case process based on the utility's realized return on equity according to a predefined formula. Typically, formula rates start with the setting of base rates and determining the authorized rate of return, both usually established as part of a general rate case. After that, the utility's realized return on equity is calculated (for the prior period) and compared to the authorized level.[16] Rate adjustments (either decreases or increases) are triggered when the realized return on equity differs from the AROE. The comparison of realized and authorized rates of return occurs annually and limits the regulatory lag that may arise between general rate cases. Similar to trackers, common concerns related to the use of formula rates include the ability to adequately review utility expenditures in annual expedited processes and the potential to shift investment risk from the utility to ratepayers.

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[15] In reality, this may only be true to some extent, as forecasts (costs and/or sales) are inherently prone to error and may deviate from the actual values.

[16] There are other versions of formula rates that use the comparison of projected returns on equity to AROEs or a combination of projected and AROE comparisons.

45. Formula rate plans are generally used to address changing conditions in between rate cases, and thus reduce the frequency of rate cases.[17] Such changing conditions may include some combination of slow sales growth, increasing operating costs and increasing capital spending (e.g., asset replacements and upgrades), which result in an imbalance between costs and sales growth between rate cases. For example, in 2014, the Illinois Commerce Commission approved a formula rate plan for Commonwealth Edison (ComEd) to ensure that ComEd implemented its grid modernization plans expeditiously. Such an undertaking would require sizable capital expenditures not recoverable until the next rate case. The formula rate plan permitted ComEd to true-up rates to recover such costs on a backward- and forward-looking basis.

46. Formula rates, as described, could mitigate the need for frequent rate cases, but are more complicated to implement than a tracker. Developing a formula rate plan would require the BLPC to develop (and the FTC and stakeholders to review) a full regulatory approach, including how to treat over- and under-earnings (relative to the allowed ROE). Implementing a formula rate plan would require a review of utility earnings (rather than focus on the 100/100 investments, on an annual basis), albeit typically on an expedited basis.

3. Multi-Year Rate Plans

47. Multi-year rate plans (MRPs) are, in their most straightforward description, rate plans that extend over multiple years with formulaic or pre-determined revenue requirements. While frequently discussed for enhanced incentives for cost control, MRPs can be structured to enable investments through a series of consecutively forecasted revenue requirements referred to as the "stair-step" approach.[18] During the rate-case for an MRP using the stair-step approach, the utility proposes forecasted revenue requirements for, typically, the next 3-5 years. Once approved, the forecasted revenue requirements increase (or decrease) according to the projected test years without the need for a general rate case. To avoid over-earning from changes in expenditures or revenues (relative to the forecast), earning sharing

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[17] Edison Electric Institute, Alternative Regulation for Emerging Utility Challenges: 2015 Update, prepared by Pacific Economics Group, November 11, 2015 (EEI 2015 Update).

[18] Under more formulaic approaches to setting revenue requirements for MRPs (such as inflation minus productivity or "I-X" approaches), increased capital investments can be incorporated through adjustments for exogenous expenditures.

mechanisms can be used. These mechanisms refund customers some portion of earnings over AROE. MRPs include a "stay-out" clause, which typically prevents the utility from refiling a rate case unless the earned return on equity is below a pre-determined level. By extending the time between rate cases and the use of forecasted revenue requirements, the use of an MRP could enable the investments to meet the 100/100 Vision.

48. Unlike a tracker, the use of an MRP is not tailored to a capital investment plan and would require BLPC to formulate (and the FTC to review) a full regulatory plan. The development of a stair-step MRP includes specification of components beyond the traditional rate case, including potential guardrails to mitigate the risks of over or under-earning and, in some cases, additional annual reconciliations. Concerning the revenue requirement, the BLPC would need to develop, and the FTC and stakeholders would need to review, forecasts for the full revenue requirement going out multiple years. The development of the revenue requirement would require the BLPC, the FTC, and stakeholders to develop new capabilities, which, while not necessarily difficult, would be an increased burden. The future capital costs required for the 100/100 Vision are uncertain, which would add to the difficulty of review.

V. Conclusion

49. The BLPC has proposed the Clean Energy Transition Rider to recover the investments associated with the transition towards the 100/100 Vision. The CETR will initially be used to recover the costs in the CETP, which includes investments through 2024. A tracker can provide an acceptable balance between regulatory oversight requirements and process burdens while enabling the utility to make investments significantly outside of its typical capital plan. Given the circumstances facing the BLPC, including significant investments beyond "business as usual," the potential for unsustainably low returns due to regulatory lag, and the regulatory burden of sequential rate cases, a tracker represents a reasonable approach to recover the CETP costs. The components of the CETR proposed by the BLPC generally follow regulatorily acceptable precedents for trackers and are matched to the operating context of the BLPC, as illustrated in Figure 10. Alternatives to a tracker, including the use of formula rates, multi-year rate plans, or holding annual rate cases, could similarly enable the required 100/100 Vision investments, but with a more significant regulatory burden to the FTC, the BLPC, and stakeholders. While the full set of

investments to enable the 100/100 Vision will require new regulatory processes, a tracker to support the CETP is a reasonable first step. In the long-run, an approach that perhaps combines these different alternatives but tailored towards Barbados' specific situations may need development.

Figure 10: Components of the CETR

Component	Description	Contextual Justification	Specifications
Scope	• Broad	• Investments are varied in type and uncertain concerning timing and scale	• Depreciation expense, tax expense, allowed return, and operation and maintenance associated with the CETP
Approval Process	• Multiple levels	• Provides multiple opportunities to review investments, which aligns with the broad scope included in the tracker	• Approval of broad categories and approval of the CETP • Approval of specific project budgets • Annual approval of expenditures for recovery • Investments added to rate base during next rate case
Cost Containment	• Multi-level investment review • Cap on rate increases (if required)	• Tracker is not anticipated to increase total customer bills • Provides flexibility to adapt with cost containment if required	• CETR investments are anticipated to be offset by fuel cost savings • If costs from the CETR exceed the fuel cost offsets, the FTC may consider an annual rate increase cap, with revenues and appropriate interest delayed to subsequent years

Appendix: Capital Tracker Examples in the United States

State	Company Name	Tracker Name	Eligible Investments
AL	Alabama Power	Rate Certificated New Plant	Any approved by Commission through CPCN
AR	Empire District Electric	Alternative Generation Environmental Recovery Rider	Environmental
AR	Oklahoma Gas & Electric	Smart Grid Rider	System-wide smart grid implementation
AR	SWEPCO	Alternative Generation Recovery Rider	New generation
AR	SWEPCO	Rider Environmental Compliance Surcharge	Environmental
AZ	Arizona Public Service	Renewable Energy Standard Adjustment Schedule	Renewables not recovered in base rates
AZ	Arizona Public Service	Environmental Improvement Surcharge	Environmental improvement projects
AZ	Arizona Public Service	Four Corners Rate Rider Surcharge	Generation
AZ	Tucson Electric Power	Environmental Compliance Adjustor	Miscellaneous environmental projects
CA	Pacific Gas & Electric	Smart Grid Memorandum Account	Smart grid projects that received DOE matching funds
CA	Pacific Gas & Electric	Smart Grid Pilot Deployment Project Balancing Account	Pilot programs for smart grid line sensors, volt/VAR optimization, detection and location of distribution line outages and faulted circuits, and information technology investments to improve short term demand forecasting for power procurement
CA	San Diego Gas & Electric	Energy Storage Balancing Account	Projects to store solar energy
CA	San Diego Gas & Electric	Advanced Metering Infrastructure Balancing Account	AMI
CA	Southern California Edison	SmartConnect Balancing Account	Advanced metering infrastructure project
CA	Southern California Edison	Solar PV Balancing Account	Solar generation
CO	Black Hills Colorado Electric	Transmission Cost Adjustment Rider	Transmission projects
CO	Black Hills Colorado Electric	Clean Air Clean Jobs Act Rider	Gas-fired generation
CO	Public Service Company of Colorado	Transmission Cost Adjustment	Transmission projects
CO	Public Service Company of Colorado	Clean Air Clean Jobs Act Rider	Miscellaneous environmental projects including gas-fired generation, scrubbers

CT	Connecticut Light & Power	System Resiliency Plan	Structural hardening
DC	Potomac Electric Power	Underground Project Charge	Undergrounding of specific feeders
DE	Delmarva Power & Light	Utility Facility Relocation Charge	Replacements due to mandated relocations not otherwise reimbursed
FL	Florida Power and Light	Environmental Cost Recovery Clause	Miscellaneous environmental projects
FL	Florida Power and Light	Capacity Cost Recovery Clause	Nuclear power
FL	Florida Power and Light	Generation Base Rate Adjustment	Generation
FL	Gulf Power	Environmental Cost Recovery Clause	Miscellaneous environmental projects
FL	Progress Energy Florida	Environmental Cost Recovery Clause	Miscellaneous environmental projects
FL	Progress Energy Florida	Capacity Cost Recovery Clause	Nuclear power
FL	Progress Energy Florida	Generation Base Rate Adjustment	Generation
FL	Tampa Electric	Environmental Cost Recovery Clause	Miscellaneous environmental projects
GA	Georgia Power Company	Environmental Compliance Cost Recovery	Miscellaneous environmental projects
GA	Georgia Power Company	Nuclear Construction Cost Recovery	Nuclear generation
HI	Hawaii Electric Light	Renewable Energy Infrastructure Program Surcharge	Renewable energy infrastructure
HI	Hawaiian Electric Company	Renewable Energy Infrastructure Program Surcharge	Renewable energy infrastructure
HI	Maui Electric	Renewable Energy Infrastructure Program Surcharge	Renewable energy infrastructure
ID	PacifiCorp	Energy Cost Adjustment Mechanism	Lake Side II generation facility
IN	Duke Energy Indiana	Qualified Pollution Control Property	Miscellaneous environmental projects
IN	Duke Energy Indiana	Integrated Coal Gasification Combined Cycle Generating Facility Revenue Recovery Adjustment	Integrated gasification combined cycle generating plant
IN	Indiana Michigan Power	Clean Coal Technology Rider	Miscellaneous environmental projects
IN	Indianapolis Power & Light	Environmental Compliance Cost Recovery	Miscellaneous environmental projects
IN	Northern Indiana Public Service	Environmental Cost Recovery Mechanism	Miscellaneous environmental projects
IN	Northern Indiana Public Service	Transmission, Distribution & Storage System Improvement Charge	Investments to maintain the capacity deliverability of system and replacement of ageing infrastructure, economic development
KY	Kentucky Power	Environmental Cost Recovery Surcharge	Miscellaneous environmental projects
KY	Kentucky Utilities	Environmental Cost Recovery Surcharge	Miscellaneous environmental projects

KY	Louisville Gas & Electric	Environmental Cost Recovery Surcharge	Miscellaneous environmental projects
LA	Cleco Power	Infrastructure and Incremental Costs Recovery	Projects to be determined in subsequent filings to Commission
LA	Entergy Gulf States Louisiana	Formula Rate Plan-3	Acquisition of generating facility, new generating facility or refurbishment of an existing generating facility if the revenue requirement related to the project exceeds $10 million
LA	Entergy Louisiana	Formula Rate Plan 7	Cost of Ninemile 6 natural gas generating facility; New generating facility, acquisition of a generating facility, or refurbishment of an existing generating facility if the revenue requirement related to the project exceeds $10 million
MA	Massachusetts Electric	Net CapEx Factor	Potentially all distribution investments
MA	Massachusetts Electric	Solar Cost Adjustment Provision	Solar generation
MA	Massachusetts Electric	Smart Grid Adjustment Provision	Pilot smart grid investments including AMI, high-speed communications network, in-home energy management devices, distribution automation, advanced capacitor control, advanced grid monitoring, remote fault indicators
MA	Nantucket Electric	Solar Cost Adjustment Provision	Solar generation
MA	Nantucket Electric	Smart Grid Adjustment Provision	Pilot smart grid investments including AMI, high-speed communications network, in-home energy management devices, distribution automation, advanced capacitor control, advanced grid monitoring, remote fault indicators
MA	NSTAR Electric	Capital Projects Scheduling List	Stray voltage inspection survey and remediation program; double pole inspections, replacements, and restorations; and maintenance hole inspection, repair, and upgrade
MA	NSTAR Electric	Smart Grid Adjustment Factor	Smart grid pilot
MA	Western Massachusetts Electric	Solar Program Cost Adjustment	Solar generation
MD	Baltimore Gas & Electric	Electric Reliability Investment Surcharge	Upgrades to improve poorest performing feeders, selective undergrounding, expanded recloser development on 13kV and 34 kV lines, diverse routing of 34 kV supply circuits
MD	Delmarva Power & Light	Grid Resiliency Charge	Feeder hardening
MD	Potomac Electric Power	Grid Resiliency Charge	Feeder hardening
ME	Central Maine Power	Customer Relationship Management & Billing Rate Adjustment	Customer relationship management & billing system replacement
MN	Interstate Power & Light	Renewable Energy Recovery Adjustment	Renewable generation

MN	Minnesota Power	Arrowhead Regional Emission Abatement Rider	Miscellaneous environmental projects
MN	Minnesota Power	Transmission Cost Recovery Rider	Incremental transmission investment
MN	Minnesota Power	Renewable Resource Rider	Renewable generation
MN	Minnesota Power	Rider for Boswell Unit 4 Emission Reduction	Miscellaneous environmental projects
MN	Northern States Power (Xcel Energy)	Metropolitan Emissions Reduction Project (later called Environmental Improvement Rider)	Miscellaneous environmental projects
MN	Northern States Power (Xcel Energy)	Transmission Cost Recovery Rider	Incremental transmission investment
MN	Northern States Power (Xcel Energy)	Renewable Energy Standard Cost Recovery Rider	Renewable generation
MN	Northern States Power (Xcel Energy)	Mercury Cost Recovery Rider	Miscellaneous environmental projects
MN	Otter Tail Power	Renewable Resource Cost Recovery Rider	Renewable generation
MN	Otter Tail Power	Transmission Cost Recovery Rider	Incremental transmission investment
MS	Mississippi Power	Environmental Compliance Overview Plan Rate	Miscellaneous environmental projects
ND	Montana-Dakota Utilities	Environmental Cost Recovery Tariff	Miscellaneous environmental projects
ND	Montana-Dakota Utilities	Generation Resource Recovery Rider Tariff	New Generation
ND	Northern States Power-MN	Transmission Cost Rider	Transmission projects
ND	Northern States Power-MN	Renewable Energy Rider	North Dakota based renewable generation
ND	Otter Tail Power	Renewable Resource Rider	Renewables
ND	Otter Tail Power	Transmission Facility Cost Recovery Tariff	Transmission investments required to serve retail customers
ND	Otter Tail Power	Environmental Cost Recovery Tariff	Miscellaneous environmental projects
NH	Granite State Electric	Reliability Enhancement Plan Capital Investment Allowance	Feeder hardening and asset replacement
NH	Public Service Company of New Hampshire	Energy Service	Miscellaneous environmental projects
NH	Public Service Company of New Hampshire	Reliability Enhancement Plan	Reliability improvements
NJ	Public Service Electric and Gas	Solar Generation Investment Program	Solar generation
NJ	Public Service Electric and Gas	Capital Infrastructure Investment Program	Reliability upgrades & feeder replacement
NJ	Public Service Electric and Gas	Energy Strong Adjustment Mechanism	Substation flood mitigation, gird reconfiguration strategies, and smart grid

OH	Cleveland Electric Illuminating	Rider AMI	Ohio Site Deployment
OH	Cleveland Electric Illuminating	Delivery Capital Recovery Rider	Distribution, subtransmission, general, and intangible plant not included in the most recent rate case
OH	Duke Energy Ohio	Infrastructure Modernization Distribution Rider	Electric AMI
OH	Duke Energy Ohio	Distribution Capital Investment Rider	Distribution capital investments not recovered through other trackers
OH	Ohio Edison	Rider AMI	Ohio Site Deployment
OH	Ohio Edison	Delivery Capital Recovery Rider	Distribution, subtransmission, general, and intangible plant not included in most recent rate case (filed in 2007)
OH	Ohio Power	Distribution Investment Rider	Net distribution capital additions since the date certain of most recent rate case not recovered through other riders
OH	Ohio Power	GridSMART Rider (Phase I)	Smart grid
OH	Toledo Edison	Rider AMI	Ohio Site Deployment
OH	Toledo Edison	Delivery Capital Recovery Rider	Power distribution, subtransmission, general, and intangible plant not included in most recent rate case (filed in 2007)
OK	Oklahoma Gas & Electric	System Hardening Recovery Rider	Undergrounding and other circuit hardening
OK	Oklahoma Gas & Electric	Smart Grid Rider	Smart grid
OK	Oklahoma Gas & Electric	Crossroads Rider	Crossroads Wind Farm
OK	Public Service Company of Oklahoma	Advanced Metering Infrastructure Tariff	Advanced metering infrastructure deployment
OK	Public Service Company of Oklahoma	System Reliability Rider	Grid resiliency projects
OR	PacifiCorp	Renewable Adjustment Clause	Renewable generation
OR	PacifiCorp	Lake Side 2 Tariff Rider	Generation
OR	PacifiCorp	M2O Transmission Rider	Mona to Oquirrh transmission line only if the line is placed into service within six months of May 31, 2013
OR	Portland General Electric	Renewable Adjustment Clause	Renewable generation
PA	Duquesne Light	Smart Meter Charge Rider	AMI
PA	Metropolitan Edison	Smart Meters Technologies Charge	AMI
PA	PECO	Smart Meter Cost Recovery Rider	AMI
PA	PECO	Distribution System Improvement Charge	Storm hardening and resiliency measures, underground cable replacement, substation retirements, and facility relocations
PA	Pennsylvania Electric	Smart Meters Technologies Charge	AMI
PA	Pennsylvania Power	Smart Meters Technologies Charge	AMI
PA	PPL Electric Utilities	Act 129 Compliance Rider	AMI

PA	PPL Electric Utilities	Distribution System Improvement Charge	Non-expense reducing, non-revenue producing infrastructure replacement projects (e.g., poles, wires)
PA	West Penn Power	Smart Meter Surcharge	AMI
RI	Narragansett Electric (electric operations)	Electric Infrastructure, Safety, and Reliability Plan Factor	Replacements and load growth
SC	South Carolina Electric & Gas	NA	Nuclear generation
SD	Black Hills Power	Environmental Improvement Adjustment tariff	Miscellaneous environmental projects
SD	Black Hills Power	Phase in plan rate	Gas-fired generation
SD	Northern States Power-MN	Environmental Cost Recovery Tariff	Miscellaneous environmental projects
SD	Northern States Power-MN	Transmission Cost Recovery Tariff	Transmission
SD	Northern States Power-MN	Infrastructure Rider	Generation
SD	Otter Tail Power	Transmission Cost Recovery Tariff	Retail sales portion of specific transmission projects
SD	Otter Tail Power	Environmental Quality Cost Recovery Tariff	Miscellaneous environmental projects
TX	AEP Texas Central	Advanced Metering System Surcharge	AMI
TX	AEP Texas North	Advanced Metering System Surcharge	AMI
TX	Centerpoint Energy Houston Electric	Advanced Metering System Surcharge	AMI
TX	Centerpoint Energy Houston Electric	Distribution Cost Recovery Factor	Change in net distribution rate base since last rate case
TX	Oncor Electric Delivery	Advanced Metering System Surcharge	AMI
TX	Texas-New Mexico Power	Advanced Metering System Surcharge	AMI
VA	Appalachian Power	Environmental & Reliability Cost Recovery Surcharge	Miscellaneous environmental & reliability projects
VA	Appalachian Power	Environmental Rate Adjustment Clause	Miscellaneous environmental projects
VA	Appalachian Power	Generation Rate Adjustment Clause	Dresden plant
VA	Virginia Electric Power	Rider S	Virginia City Hybrid Energy Center
VA	Virginia Electric Power	Rider R	Bear Garden Generating Station
VA	Virginia Electric Power	Rider W	Warren County Power Station
VA	Virginia Electric Power	Rider B	Biomass conversions
VA	Virginia Electric Power	Rider BW	Brunswick County Power Station (natural gas combined cycle generating station)
WV	Appalachian Power	Construction/765kW Surcharge	Generation, environmental
WV	Monongahela Power	Vegetation Management Surcharge	Capitalized distribution vegetation management expenses

WV	Potomac Edison	Vegetation Management Surcharge	Capitalized distribution vegetation management expenses
WV	Wheeling Power	Construction/765kW Surcharge	Generation, environmental
WY	Black Hills Power	Cheyenne Prairie Generating Station rate rider tariff	Construction of Cheyenne Prairie Generating Station
WY	Cheyenne Light, Fuel, & Power	Cheyenne Prairie Generating Station rate rider tariff	Construction of Cheyenne Prairie Generating Station

Sources: Edison Electric Institute, Alternative Regulation for Emerging Utility Challenges: 2015 Update, prepared by Pacific Economics Group, November 11, 2015 (EEI 2015 Update).

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