DIRECT TESTIMONY OF
AHMAD FARUQUI, PH.D.

ON BEHALF OF
GEORGIA POWER COMPANY

DOCKET NO. 42516

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME, TITLE, AND BUSINESS ADDRESS.

A. My name is Ahmad Faruqui. I am a Principal with The Brattle Group. My business address is 201 Mission Street, Suite 2800, San Francisco, California 94105.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING?

A. I am testifying on behalf of Georgia Power Company ("Georgia Power" or the "Company") before the Georgia Public Service Commission ("Commission").

Q. DR. FARUQUI, PLEASE SUMMARIZE YOUR EDUCATIONAL AND PROFESSIONAL EXPERIENCE.

A. I am an energy economist with over 40 years of consulting and research experience. I have also taught economics for seven years at three universities.

My consulting practice is focused on customer engagement. My areas of expertise include rate design, demand response, energy efficiency, distributed energy resources, advanced metering infrastructure, plug-in electric vehicles, energy storage, inter-fuel substitution, combined heat and power, microgrids, and demand forecasting.

I have worked for nearly 150 clients on five continents. These include electric and gas utilities, state and federal commissions, independent system operators, government agencies, trade associations, research institutes, and manufacturing companies. I specifically have testified or appeared before commissions in Alberta (Canada), Arizona, Arkansas, California, Colorado, Connecticut, Delaware, the District of Columbia, FERC, Illinois, Indiana, Kansas, Maryland, Minnesota, Nevada, Ohio, Oklahoma, Ontario (Canada), Pennsylvania, ECRA (Saudi Arabia), and Texas. Additionally, I have presented to governments in Australia, Canada, Egypt, Ireland, the Philippines, Thailand and the United Kingdom and given seminars on six continents.

My research has been cited in *Business Week*, *The Economist, Forbes, National Geographic, The New York Times, San Francisco Chronicle, San Jose Mercury News, Wall Street Journal and USA Today*. I have appeared on Fox Business News, National Public Radio, and Voice of America. I have authored, co-authored, or co-edited four books and more than 150 articles, papers, and reports on energy matters. I have been published in peer-reviewed journals such as *Energy Economics*, *Energy Journal, Energy Efficiency*, *Energy Policy*, *Journal of Regulatory Economics*, and *Utilities Policy* and trade journals such as *The Electricity Journal* and the *Public Utilities Fortnightly*.

I hold a Bachelor of Arts Degree and a Master of Arts degree from the University of Karachi, Pakistan, a Master of Arts in Agricultural Economics, and a Ph.D. in Economics from the University of California at Davis. Exhibit___(AF-1) includes my full curriculum vitae.

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE COMMISSION?

A. No, I have not previously testified before the Commission.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to comment on the merits of Georgia Power's proposal to expand its offering of three-part rates and to recover the fixed customer-related costs through its monthly service charge. My testimony will address the structure, rationale, and demonstrated success of the specific rate design changes that Georgia Power has proposed. I will discuss how modern rate design sends the appropriate price signals to customers and achieves the goals of promoting economic efficiency and equity.

II. <u>MODERNIZATION OF RATE DESIGN</u>

Q. ARE UTILITIES IMPLEMENTING MODERNIZED AND IMPROVED RATE DESIGNS AROUND THE COUNTRY?

A. Yes, modern rate designs are beginning to be deployed throughout the United States. Utilities are increasingly moving away from the traditional volumetric rate that has been the hallmark of residential tariffs for the past century toward modern rate designs that are described later in my testimony.

Rate designs are being modernized to accommodate changes that have been taking place on both the supply side and the demand side of the electricity market. In particular, utilities are making three changes to the traditional volumetric design. First, utilities are introducing cost-reflective fixed charges to recover the costs of metering, billing, customer care, and minimum distribution components. Second, utilities are introducing demand charges to recover the capacity cost of delivering electricity. And, third, utilities are introducing time-varying volumetric charges to recover the costs of generating electricity.

Q. WHAT CHANGES ON THE SUPPLY-SIDE ARE DRIVING THE NEED FOR RATE DESIGN MODERNIZATION?

A. On the supply-side, utilities are changing their generation mix in response to market forces, governmental directives, and regulatory decisions. Additionally, across the country, the one-way grid is beginning to evolve into an integrated two-way grid. Finally, homes are increasingly being equipped with smart meters that more efficiently enable the transition to modern rate design.

Q. WHAT CHANGES ON THE DEMAND-SIDE ARE DRIVING THE NEED FOR RATE DESIGN MODERNIZATION?

A. Digital technologies such as smart homes, electric vehicles, distributed generation, and smart metering are changing the way customers interact with electric utilities. Modern utility customers have access to far more information regarding their electricity use and far greater control over their consumption of electricity. Customers are increasingly turning into “prosumers” (consumers who are also producers) through adoption of solar panels, battery storage, and fuel cells.

Another impetus for rate modernization is that customers have diverse preferences and want to be able to choose a rate that best fits their individual lifestyle. Some customers simply want the lowest bill and are willing to shift their usage around the clock to achieve that goal. Other customers prefer consistency and desire a predictable bill, even if it comes at a premium. Modern rate design leaves behind the one-size-fits-all model by embracing diverse offerings that maximize customer choice and ultimately customer satisfaction.

Q. BESIDES THE DEMAND-SIDE AND SUPPLY-SIDE FACTORS YOU HAVE JUST DISCUSSED, WHAT OTHER DRIVERS ARE THERE TO MODERNIZING RATE DESIGN?

A. Equity is a key consideration for modern rate design. Historic rate designs, structured to recover the bulk of cost through consumption, often inadvertently led to hidden cross-subsidies between customers, which goes against the principal of equity.

Q. CAN YOU PROVIDE AN EXAMPLE OF HOW HISTORICAL RATE DESIGNS STRUCTURED TO RECOVER COSTS THROUGH CONSUMPTION HAVE LED TO CROSS-SUBSIDIES?

A. Yes. Customers who install self-generation equipment, such as rooftop PV panels, see an immediate reduction in their net energy consumption; but the cost to connect those customers to the grid does not go down proportionately. This can also occur when customers install energy efficiency measures that reduce their energy usage, creating a shortage of revenue to cover utility fixed costs, which raises electric rates for all customers. These revenue deficiencies can be ameliorated by moving to three-part rates, which consists of a monthly service charge, a demand charge, and a volumetric charge.

Q. WHAT ARE THE PRIMARY BENEFITS OF MODERNIZING RATE DESIGNS?

A. Modern rates allow utilities to send cost-reflective and equitable price signals that incentivize efficient customer behavior while prioritizing system reliability and environmental sustainability. They also promote equity (or fairness) among customers. And, by creating bill stability for customers, modern rate designs also create revenue stability for utilities.

Q. WHAT ARE THE DIFFERENT TYPES OF MODERN RATE DESIGNS?

A. Modern rates share one common trait—such rates reflect the cost structure of generating and delivering electricity. Modern rate designs conform to the principles outlined in James C. Bonbright's *Principles of Public Utility Rates*. In sum, modern rate designs support cost causation. Bonbright argues there are eight principles to modern rate design, which has been expanded into ten principles.

The Bonbright principles are almost universally cited in rate proceedings throughout the U.S. and are often used as a foundation for designing rates. Although Bonbright notes ten principles, they can essentially be condensed into five core principles:

1. *Economic Efficiency* – The price of electricity should convey to the customer the cost of producing it, ensuring that resources consumed in the production and delivery of electricity are not wasted. If the price is set equal to the cost of providing a kWh, customers who value the kWh more than the cost of producing it will use the kWh, and customers who value the kWh less will not use it. This will encourage the development and adoption of energy technologies that are capable of providing the most valuable services to the power grid, and the greatest benefit to electric customers as a whole.

2. *Equity* – There should be no unintentional subsidies among customer types. A classic example of the violation of this principle occurs under volumetric rate pricing structures (*i.e.*, cents/kWh). Since customers have different load profiles, "peaky" customers, who use more electricity when it is most expensive, are subsidized by less "peaky" customers who overpay for cheaper off-peak electricity. Note that equity, in the electric sense, is not the same as social justice, which is related to differences in socioeconomic status rather than cost. The pursuit of one is not necessarily the pursuit of the other, and vice versa.

3. *Revenue Adequacy and Stability* – Rates should recover the authorized revenues of the utility and should promote revenue stability. Theoretically, all rate designs can be implemented to be revenue neutral within a class, but this would require perfect foresight of the future. Changing technologies and customer behaviors make load

forecasting more difficult and increase the risk of the utility either under-recovering or over-recovering costs when rates are not cost reflective.

4. *Bill Stability* – Customer bills should be stable and predictable while striking a balance with the other ratemaking principles. Rates that are not cost reflective will tend to be less stable over time, since both costs and loads are changing over time. For example, if fixed infrastructure costs are spread over a certain number of kWh's in year 1, and the number of kWh's is cut in half or doubles in year 2, then the price per kWh in year 2 will double even though there is no change in the underlying infrastructure cost of the utility.

5. *Customer Satisfaction* – Rates should enhance customer satisfaction. Because most residential customers devote relatively little time to reading their electric bills, rates need to be relatively simple so that customers can understand them and perhaps respond to the rates by modifying their energy usage patterns. Giving customers meaningful cost reflective rate choices will help enhance customer satisfaction.

Q. WHAT ARE THE VARIOUS FORMS OF MODERN RATE DESIGN?

A. Modern rate designs come in several forms. Table 1 includes representative examples of modern rate design. Utilities may pick and choose from this menu to decide which rate designs to offer to best meet the diverse needs of their customers. Each utility's choices are likely to be informed by the utility's field experience with its customers. It is unlikely that all utilities will offer all these rates to their customers.

Table 1 – Examples of Modern Rate Designs

Rate Design	Definition
Three-Part rates	Rates contain charges for customer related costs, energy costs and demand costs. Demand charges are applied based on customers' maximum demand (kW) for electricity demand, typically over a span of 15, 30, or 60 minutes. Energy charges may be time-of-use based, seasonal, or flat.
Fixed bill	Customers pay a fixed monthly bill sometimes accompanied with tools for lowering the bill (such as incentives for lowering peak usage).
Peak-time rebates	Customers are paid a rebate if on certain days and during certain hours on those certain days they reduce their energy consumption relative to their baseline energy consumption.
Time-of-Use (TOU) rates	The day is divided into peak and off-peak time periods. Prices are higher during the peak period to reflect the higher cost of supplying energy during that period and lower during the off-peak period to reflect the lower cost of supplying energy during that period.
Dynamic pricing rates	Customers pay higher prices during certain times on certain days and lower prices during other times. Examples include critical peak pricing rates, variable peak pricing rates and real time pricing rates.

It should be noted that with the advent of smart meters, electricity rate portfolios can combine two or even three of the rate designs listed in Table 1.

Q. WHAT IS THE MOST COST-REFLECTIVE RATE STRUCTURE?

A. Bonbright says that the most cost-reflective rate is a three-part rate that combines:

1. A fixed monthly charge to recover the full costs of billing, metering and customer service and sometimes it also includes a minimum distribution system element.

2. A demand charge for recovering distribution capacity costs that is often recovered on a non-coincident peak basis. Sometimes the demand charge will also include the cost of transmission capacity and the cost of generation capacity; but the practice varies by utility.

3. A time-varying energy charge for recovering energy costs that may include the cost of transmission capacity and the cost of generation capacity. This could take one of many forms, such as a simple time-of-use rate, a critical-peak pricing rate, a variable-peak pricing rate, or a real-time pricing rate.

Q. WHY IS IT IMPORTANT FOR THE UTILITY TO USE A COST-REFLECTIVE RATE DESIGN?

A. A cost-reflective rate design ensures the promotion of economic efficiency as well as equity among consumers.

Q. WHICH UTILITIES ARE OFFERING MODERN RATE DESIGNS TODAY?

A. Exhibit___(AF-2) enumerates 62 three-part rates that are being offered by utilities (including Georgia Power) around the country today. The precise structure of the rate varies by utility. Sometimes the demand charge is based on non-coincident demand, and sometimes on coincident demand. The time interval that the demand is measured varies from 15 minutes to an hour. In some cases, the volumetric rate is a flat rate, while in other cases it is a time-varying energy rate.

Many utilities across the country, including Georgia Power, have deployed TOU rates to their residential customers. While these rates were introduced decades ago, TOU rates are becoming more widespread and deployed by more utilities due to the emergence of Advanced Metering Infrastructure (AMI).

Additionally, Peak Time Rebates (PTR) are now being offered by utilities in Maryland, California, and Illinois.

Oklahoma Gas & Electric (OGE) has about 20% of its customers on technology-enabled dynamic pricing rates.

Real Time Pricing (RTP) is being offered to residential customers in Illinois and some 50,000 customers are on it.

Flat bill options are popular in a number of states including the Carolinas, Florida, Georgia, Indiana, and Oklahoma, and are being considered by several utilities around the country.

Q. HAVE CUSTOMERS ACCEPTED MODERN TARIFFS?

A. Yes, customers have accepted modern tariffs where they have been offered. A majority of modern tariffs have been implemented on an optional basis, either opt-in or default, and the numbers of customers voluntarily enrolling (either opting in or declining to opt out) in the new tariffs indicate a broad acceptance of the innovative rate offerings. Selected examples of customer participation are shown in Table 2 below.

Table 2 – Examples of Customer Participation in Modern Rate Offerings

Utility or Location	Type of Rate	Applicability	Participating Customers
Arizona (APS)	Three-Part rate	Opt-in	20% of APS' residential customers
Georgia (GPC)	Fixed bill	Opt-in	14% (290,000)
California (PG&E, SCE, SDG&E)	Time-of-Use (TOU)	Default (2019)	TBD – 75-90%*
Colorado (Fort Collins)	Time-of-Use (TOU)	Mandatory (for residential)	100%
Illinois (ComEd, Ameren Power Illinois)	Real Time Pricing (RTP)	Opt-in	50,000

Utility or Location	Type of Rate	Applicability	Participating Customers
Maryland (BGE, Pepco, Delmarva)	Dynamic Peak Time Rebate (PTR)	Default	80%
Oklahoma (OGE)	Variable Peak Pricing (VPP)	Opt-in	20% (130,000)
Ontario, Canada (several)	Time-of-Use (TOU)	Default	90% (3.6 million)

*Estimated participation based on historical trends

Q. ARE THE GENERAL CONCEPTS OF MODERN RATE DESIGN FAMILIAR TO CUSTOMERS?

A. On the whole, yes. Customers have found it relatively easy to understand modern rate designs. They have already encountered those concepts in other aspects of their lives. Fixed charges are commonly encountered when renting cars, buying Amazon Prime or Netflix.

Q. HOW MIGHT MODERN RATE DESIGNS IMPACT CUSTOMERS' BILLS?

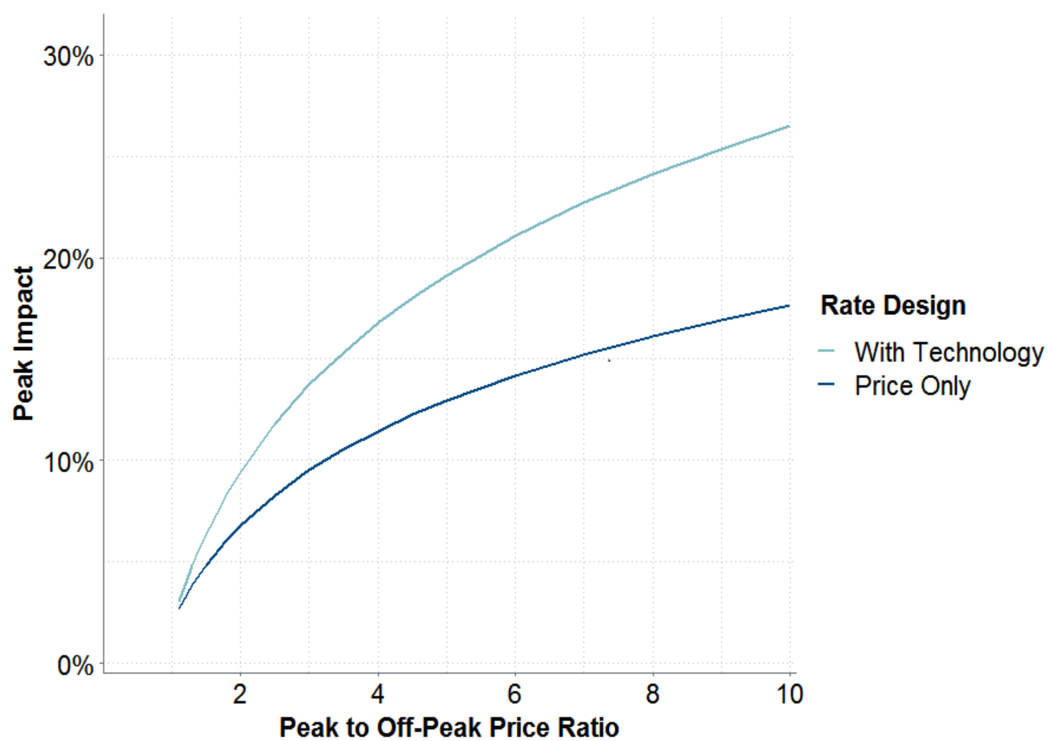
A. Under volumetric rates small customers have been subsidized by large customers, and low load factor customers have been subsidized by high load factor customers. Thus, any change in rate design that redresses these subsidies will cause bills for customers who were overpaying to go down and for those who were underpaying to go up. As discussed later in my testimony, there are ways of smoothing the transition.

Intelligently-designed modern rates leverage economic efficiencies to ensure that the overall rate savings in the long run will exceed any bill increases in the short run that some customers might experience. Because the modern rate will be revenue-neutral, it will initially produce savings for some customers, which in the aggregate will be equal to the aggregate bill increases experienced by other customers. However, as a result of offering cost-reflective price signals and creating opportunities for load shifting, customer behavior will change over time to reduce total system costs. Those net savings will accrue to ratepayers and put downward pressure on rates in the future.

Q. DO CUSTOMER LOAD SHAPES CHANGE IN RESPONSE TO MODERN RATE DESIGNS?

A. Yes, there is an extensive body of evidence that customers are responsive to rate changes and will shift their load shapes according to price signals. I have conducted a survey of 349 experimental deployments of time-varying modern rates (including TOU, CPP, PTR, and VPP) and the customer responses to those rates. Econometric analysis indicates a clear and statistically significant relationship between the strength of the price signal and the magnitude of customer response. When paired with enabling technology, such as smart thermostats or in-home displays, the customer price response is even stronger.

Figure 1 – The impact of time-varying rates on customer peak demand



Q. WHAT IS THE BEST WAY TO TRANSITION TO THE MODERN RATE DESIGNS?

A. In order to preclude negative customer reaction and realize the full benefits of the modern rates, it is imperative that customers understand and accept the rates. There are several ways to maximize customer understanding and acceptance of modern rates:

1. Rolling out new tariffs on a gradual basis, which gives customers time to learn how the modern rates work and plan accordingly.

2. Offering the modern tariffs first, on an opt-in basis, and later transitioning to a default or mandatory basis, prevents customers from being surprised by sudden change.

3. Implementing new tariffs on accounts where customers are establishing new service, which reduces any inertia to move from a prior rate and does not bias a customer based on past bill experiences.

It may also be useful to undertake several other steps to ease the transition, such as customer education and marketing campaigns on rate options.

Q. EVENTUALLY, SHOULD MODERN RATE DESIGNS BE OFFERED ON AN OPT-IN, OPT-OUT, OR MANDATORY BASIS?

A. While opt-out deployment is the fastest way to get the largest number of customers on modern rate designs, there are pros and cons to opt-out deployment. Many states have decided to go the opt-out rate, such as California and Michigan. Earlier, the Canadian province of Ontario proceeded with opt-out deployment of simple TOU rates and now some 90% of customers are on that rate.

With both opt-in and opt-out deployment, it is always a good idea to offer a few choices to customers and to let them pick the one that best meets their lifestyle. Mandatory deployment can be done if the case is compelling. Fort Collins in Colorado has done it successfully with time-of-use rates. SRP in Arizona and Westar Energy in Kansas have placed DG customers on mandatory three-part rates. California has put DG customers on mandatory TOU rates.

III. CONCLUSIONS

Q. WHAT IS YOUR PROFESSIONAL POSITION ON GEORGIA POWER'S PROPOSAL TO INCREASE ITS BASIC SERVICE CHARGE?

A. I believe fixed charges should recover fixed costs, which is what Georgia Power is proposing to do. I support the proposal. It improves cost reflectivity in rate design. It also lowers the energy charge, all other things equal, which should encourage the adoption by customers of efficient electrification technologies.

Q. WHAT IS YOUR OPINION ON GEORGIA POWER'S PROPOSAL TO CLOSE THE TRADITIONAL RESIDENTIAL RATE TO HOMES THAT ARE NEWLY CONSTRUCTED?

A. I believe it is the right thing to do. The traditional rate design is outmoded, is not cost-reflective, and hearkens back to an era where smart meters, smart appliances, and smart thermostats were not in customer's homes. By closing off that rate for new construction, it gradually begins the journey to a future where the default offering to residential customers will be a cost-reflective three-part modern rate design.

Q. DOES THIS PROPOSAL ALSO PROMOTE MODERN RATE DESIGN?

A. Yes, it does.

Q. WHAT DO YOU CONCLUDE ABOUT GEORGIA POWER'S PROPOSAL?

A. In sum, with the deployment of smart meters, the development of an integrated grid, the advent of prosumers, and the digitalization of customer premises, the time has come to modernize rate designs. Modern rate designs can yield significant bill savings to customers while also reducing costs for the power system. Such modern rates are being rolled out across the country, and customers are happily accepting them. These solutions are also beneficial to the utility as modern rate designs help ensure the proper recovery of revenue requirements on a more cost aligned basis. There are several ways of making the transition to modern rate designs. Each utility should begin the journey and use a transition strategy that best suits its situation. Georgia Power has proposed to expand its deployment of modern rate designs and has put forward a good plan for making the transition.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.