

ARIZONA CORPORATION COMMISSION

In the Matter of the Commission's Inquiry) Generic Docket No. E00000W-13-0135
Into Retail Electric Competition)

COMMENT OF THE STAFF OF THE FEDERAL TRADE COMMISSION ¹

July 11, 2013

I. Introduction

The staff of the Federal Trade Commission (FTC) welcomes this opportunity to comment on the Arizona Corporation Commission's (ACC's) inquiry into Retail Electric Competition.² Several significant technical developments, including advanced ("smart") meters, have made it timely to consider retail electric competition as a path to gaining substantial power system efficiencies and facilitating customized electric services that benefit consumers. We have reviewed these technical developments, and our comment describes how they make retail competition feasible and increasingly attractive to consumers. The comment also explains how retail competition can lead to major system efficiencies by moving away from flat retail electricity rates and toward individually tailored electricity services, which can yield numerous consumer benefits that include rate savings, environmental improvements, innovative services not previously available, and enhanced service reliability. Within this framework for identifying the advantages of retail competition for consumers, we also provide insights and references that the ACC may find useful regarding several of the specific matters raised in the ACC's invitation to comment.

II. Interest and Experience of the FTC

The FTC is an independent agency of the United States Government responsible for maintaining competition and safeguarding the interests of consumers. The FTC does so through

¹ This comment expresses the views of the FTC's Office of the General Counsel, Office of Policy Planning, and Bureau of Economics. The comment does not necessarily represent the views of the FTC or of any individual Commissioner. The Commission, however, has voted to authorize the filing of this comment.

law enforcement, policy research, and advocacy. For example, in the field of consumer protection, the FTC enforces Section 5 of the Federal Trade Commission Act, which prohibits unfair or deceptive acts or practices. In its competition mission, the FTC enforces antitrust laws regarding mergers and unfair methods of competition that harm consumers. In addition, the FTC often analyzes regulatory or legislative proposals that may affect competition, allocative efficiency, or consumer protection. It also engages in considerable consumer education through its Division of Consumer

associated with existing production techniques, to innovate, to erode market power, and to provide the variety of products that customers are interested in buying.

Five of the most significant technical developments in the electricity industry over the past 25 years are:

- (1) a trend toward smaller, highly efficient generation units;

To initiate retail electric customer choice, a state must first remove the legal barriers to entry that alternative retailers face. That is only the first step, however, in developing effective competition. States have fostered retail electric competition by taking a variety of additional steps to educate customers about their new choices and to enhance consumer protections to the retail power sphere.

States in which customers are most active in selecting alternative suppliers have sought to address a number of key issues involved in developing retail electric competition, including:

- how to inform customers of new retail electricity suppliers and their offers;
- how customers learn the mechanics of switching to an electric service provider;
- how to serve electricity customers who do not select an alternative supplier;
- how to serve electricity customers whose supplier exits the market;
- how customers can compare offers made by different suppliers;
- how to price default (provider-of-last-resort, or "POLR") service (if any);
- how to organize billing in order to avoid consumer confusion.

These evaluations reveal that when effective retail competition is combined with the five technical developments mentioned above, customers are in a position to help address the challenges of balancing supply and demand in the power industry, either at a local level or on a wider geographic scale. When customers are compensated for providing this help, the response is often substantial.¹⁴ Such customer responses to accurate price signals reduce system costs, support reliability, and provide environmental benefits. Customer responses to higher power prices can be automated through equipment that cuts back or delays power use at pre-set price points. Alternatively, customers can manually adjust their air conditioner or other heavy power uses when meters or other communications alert them to higher prices. Reducing power use during periods of high wholesale prices can reduce overall system costs by utilizing lower-cost generation units and reducing the need for high-peaking generators to meet demand spikes. It can support reliability by cutting power consumption when the system is at greatest risk of blackouts or is in the midst of recovering from a service interruption. It can provide environmental benefits by facilitating integration of renewable energy sources and avoiding the use of older, higher-cost generators with higher pollutant emissions during peak demand periods. This DR process is a critical justification for grid modernization. Collectively, the term “smart grid” encompasses systems that support DR and the sophisticated monitoring of conditions on many components of the power grid.

We recommend that the ACC evaluate the pricing prospect that retail customer choice will help customers expand and fine-tune their uses of electricity service and contribute to balancing power supply and demand.

IV. Retail Competition Can Help the Power System Transition Away from Flat Rate Pricing That Is Associated with Increasing Costs and Threats to Reliability for All Electricity Consumers

Some recent developments appear to underscore the importance of gaining customer assistance in balancing the power system. Electric vehicles (“EVs”) are a development that

¹⁴ For a bibliography of papers on the process known as “demand response” (or “DR”) prepared by Brattle Group see Toni Enright and Ahmad Faruqi, Bibliography on Dynamic Pricing and Time-of-Use Rates, Version 2.0” (Jan. 1, 2013), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2178074 Faruqi (along with colleagues Sanem Sergici and Eric Shultz) summarized several reviews of DR projects in “Consistency of Results in Dynamic Pricing Experiments – Toward a Meta Analysis” (Jan. 29, 2013), available at <http://www.brattle.com/documents/UploadLibrary/Upload1109.pdf>

¹⁵ See, e.g., Charles J. M

illustrates this point well.¹⁶ When EVs are recharged off peak (overnight), they help flatten load profiles (reduce peaks and fill troughs in consumption) so that generation and distribution assets will be more fully utilized and their fixed costs will be spread over more power volume, at a lower per-kilowatt unit rate. Conversely, if EVs are recharged during peak demand periods, they could cause significant demand increases during the most costly time of day for power generation and could stress the grid to the detriment of reliability. Consequently, all consumers benefit if EV owners have incentives to recharge their EVs overnight even if that is not always the most convenient time for EV owners. Pricing electricity more cheaply overnight than during daytime hours provides EV owners with a powerful incentive to recharge overnight.

There is wide recognition that applying flat electricity rates for recharging EVs is inefficient and wasteful. In light of this, state regulators could lean toward singling out EVs for retail electricity prices that more closely follow marginal cost, while leaving other power uses under flat rate pricing. EV charging, however, does not differ meaningfully from other end uses of electric power. Flat rate pricing of electricity creates consequential distortions throughout the electric power industry on both the demand and the supply sides.

Flat rate electricity pricing at the retail level – in the face of volatile generation and transmission prices at the wholesale level – results in large subsidies for customers consuming power in peak demand periods and large penalties for customers consuming power in demand troughs. When any retail electric power customer receives such distorted price signals, they frequently make distorted consumption decisions and the resulting inefficiencies in the power system work to the detriment of all electricity consumers.

Further, flat rates cause all customers to face higher average system costs and lower system reliability, and create disincentives to invest either in methods to improve energy efficiency or in devices to shift consumption to off-peak periods (when system costs and wholesale electricity prices are lower). As with any market, pricing electricity closer to marginal cost improves the overall efficiency of the consumption of the good and reduces deadweight losses.¹⁷ When a customer with distributed generation (“DG”) facilities (e.g., solar panels on the roof) faces flat rates, the rates discourage investment in energy storage devices that could help balance supply and demand – most importantly, when the power system is under stress and close to being overwhelmed.

¹⁶ See also, e.g., Ahmad Faruqui, Ryan Hledik, Armando Levy, and Alan Madian, Brattle Group discussion Paper, “Will Smart Prices Induce Smart Charging of Electric Vehicles?” (July 2011), available at <http://www.brattle.com/documents/UploadLibrary/Upload966.pdf>

¹⁷ Paul L. Joskow and Catherine D. Wolfram, “Dynamic Pricing of Electricity” (Jan. 2012), available at <http://faculty.haas.berkeley.edu/wolfram/Papers/AEA%20DYNAMIC%20PRICING.pdf>.

and is emerging in other states with retail ~~elect~~ competition. In addition, now that retail

dynamic pricing options available at the retail level. Some believe that DR programs operating at the wholesale level may be less efficient than dynamic retail prices.²⁴

On the residential side, other than pilot programs and targeted customer programs, no state has switched residential POLR service to real-time retail prices or other forms of dynamic pricing (although Ontario has done so).²⁵ The general picture is that utilities have not expressed interest in or been permitted to charge dynamic prices to customers in traditionally regulated states. Part of the problem is also that traditional rate-making approaches may be ill-suited to deal with constantly varying prices or with a proliferation of innovative services, some of which entail bundling energy management services with other services. Indeed, doing so is restricted in some states because of concerns about unfair competition by utilities that might cross-subsidize their affiliates, to the disadvantage of independent suppliers.²⁶

V. Responses to Questions in the ACC's May 23, 2013, Letter to Stakeholders²⁷

1. Will retail electric competition reduce rates for all classes of customers – residential, small business, large business and industrial classes?

Yes. If retail electricity sales are opened to competition in an effective way that facilitates realization of new system efficiencies, average costs will fall for all classes of

Integration of Price Responsive Demand in Wholesale Power Markets and System Operations" (Mar. 9, 2009), available at <http://www.hks.harvard.edu/hepg/Papers/2009/Centolella%20%20PJM%20PRD%2003092009.pdf>

²⁴ James Bushnell, Benjamin F. Hobbs, and Frank A. Wolak, "When It Comes to Demand Response, Is FERC Its Own Worst Enemy?" 22:8 ElectricityJ. 9 (Oct. 2009).

²⁵ Faruqi, "Dynamic Pricing for Residential and Small C&I Customers," supra note 19, at 41.

²⁶ For example, Maine prohibits the sharing of market information between utilities and their affiliates, because such information-sharing can disadvantage independent competitors of the utility's affiliates. Lewis Tagliaferre and Susan Greenwood, "Electric Utility Restructuring: What Does It Mean for Residential and Small Retail Consumers in Maine?," Maine Policy Review 64, 66 (Fall 1999), available at http://mcspolicycenter.umaine.edu/wp-content/uploads/files/pdf_mpr/TagliaferreGreenwood_V8N2.pdf. More generally, see Comments Regarding Retail Electricity Competition, filed with the FTC by the National Alliance for Fair Competition (Apr. 2, 2001), available at <http://www.ftc.gov/os/comments/eccompetition/natallfaircomp.pdf>

²⁷ The questions and responses below follow the numbering in the ACC's letter of May 23, 2013. We address all questions except Question 8 and Question 13.

customers relative to what they would have been without increased competition.²⁸ Even if costs fall under increased retail competition, however, this does not necessarily mean that retail rates should, or actually will, fall. The reason is that once competition supplants the system that prevailed under the regulated vertically integrated monopoly, many customers may choose a different mix of services – a mix that may be “customized” or “individualized” to the specific purchaser and thus could possibly be more expensive than the historical “one-size-fits-all” service. The new product the consumer receives (electricity plus new services) may be priced higher, but it is more valuable than the old one to certain consumers. For example, a retailer with large inventories of frozen food likely would value reliability in the power supply more highly than other retailers because so much inventory is at risk of spoilage in a blackout. When electricity services are customized, simple price comparisons become more difficult and less meaningful. They may be misleading because of differences among the values of the different bundles of services and equipment that customers may select.

Jurisdictions that have adopted retail competition often have considered total customer bills in addition to rate changes. These two measures of power expenditures can be different. For example, electricity rates could increase, but total bills would fall if the rate increase led to a sufficient decrease in power consumption. Similarly, if rates shifted from being flat in all periods of the day and year to varying in a way that tracks changes in wholesale power prices (dynamic prices), then rates would be higher in some periods and lower in other periods. Customers who cut back their power use when prices are most expensive and shift power use to periods when electricity prices are lower will experience the largest decrease in their power bills. Even customers who do not reduce consumption during the most expensive periods will often have lower power bills when other customers reduce their power consumption in the face of the highest prices: a reduction in power use by a subset of customers will reduce the use of the most costly power plants and will thereby produce lower wholesale prices for all customers.

To check how these potential pricing and billing effects work out in the real world, Brattle Group and others have reviewed utility experiences where various kinds of dynamic prices have been introduced.²⁸ The general finding is that most customers, including low-income

²⁸ Assuming that the generation supply stack has the usual hockey-stick shape, the market-clearing price should fall considerably as a result, even if the re

customers, have lower bills when they choose dynamic prices. These savings are most pronounced when responses to dynamic prices are automated. Some reviews of dynamic pricing recommend an extra step: to design the system to minimize the risk that any customer seeking to obtain bill savings by reducing power use in peak demand periods will face higher power bills under dynamic pricing than under flat rate prices.³⁰

2. In addition to the possibility of reduced rates, identify any and all specific benefits of retail electric competition for each customer class.

As discussed above, retail electric competition increases power customers' ability to customize the electricity services they buy.³¹ At the same time, retail electric competition will help customers address the increasing challenges of balancing supply and demand on the electric system, which in turn will help bolster system reliability. In short, retail electric competition creates incentives for service innovations and for greater variety in the electric services available

pricing issues. See Ahmad Faruqui, Ryan Hledik, and Jennifer Palmer, "Time-Varying and Dynamic Rate Design" (2012), available at <http://www.hks.harvard.edu/hepg/Papers/2012>

to meet consumers' preferences, and provides to consumers that are lower than they otherwise would be. These changes can also improve power system performance and reliability.

3. How can the benefits of competition apply to all customer classes equally or equitably?

Competition empowers all electricity customers to customize the electric services they buy. Some customers will choose to lower their electricity bills, while others will prefer to bundle more services or equipment with their electricity purchases (thereby increasing the product's value). All customers benefit from system efficiencies and enhanced service reliability that result from retail competition, which gives customers incentives to help meet system challenges, such as integrating renewable generation sources and flattening power system's load profile to better balance supply and demand. When customers help meet system challenges, per-unit system costs are expected to be reduced for all customers relative to what they would have been without the system efficiency improvements.³²

4. Please identify the risks of retail electric competition to residential ratepayers and to the other customer classes. What entity, if any, would be the provider of last resort?

If a state does not extend appropriate protections to consumers when retail competition is introduced to the power industry, consumers could be exposed to questionable sales practices, as has occurred in other industries that lacked consumer protections.³³

The introduction (or reintroduction) of competition into regulated industries has often resulted in customers who are unaware of their choices or, even if they know choices are available, may not know how to select an alternative supplier. The more customers know about how to compare their electricity service choices, the likelier they are to have the confidence to switch to better offers. In turn, this provides incentives for suppliers to innovate and keep costs down.

States that have adopted retail choice in the power industry have taken a variety of approaches to the possibility of having a POLR service. All retail choice states have an arrangement for continuous supply of electricity if a customer's supplier abruptly leaves the

³² See also our response to Question 1.

³³ The Federal Trade Commission Act and subsequent legislation regarding consumer protection policies were enacted to address business practices that undermine efficient markets and harm consumers by taking advantage of information asymmetries, making false or misleading claims, or employing high-pressure sales tactics in approaching vulnerable populations (such as children or the elderly). See "An Overview of Consumer Protection Initiatives," available at <http://www.ftc.gov/oia/assistance/consumerprotection/overview.pdf>

industry. Some states (such as New York) require the distribution utility to provide this service until the customer picks a new supplier, while other states (such as Texas) have a competitive procurement procedure to provide this form of LRS service. For customers who do not pick a new supplier, most states assign such customers whatever system exists to handle service for customers whose supplier has left the market. An alternative approach that has been used in the natural gas industry in most of Georgia is to assign customers to a retail supplier. For example, the number of customers assigned to a supplier would be based on the number of customers the supplier previously attracted. After the initial assignment, customers can pick a different supplier whenever they so decide. All of these alternatives have been in use for several years and seem to be administratively practicable.³⁴

5. How can the Commission guarantee that there would be no market structure abuses and/or market manipulation during the transition to and implementation of retail electric competition?³⁵

In moving toward retail electricity competition, one issue that states have encountered is whether to restructure vertically integrated utilities with preexisting monopoly power. States have been concerned that the distribution utility generates or holds a large proportion of the wholesale capacity available to electricity marketers in the state. A near-monopoly of generation sources in the hands of an incumbent distribution utility that also sells electricity at the retail level could make it difficult for potential competing retail electricity marketers to serve business and residential customers at competitive prices. To address this concern, some states (for instance, New York) have required distribution utilities to divest or all of their generation capacity in order to create independent sources to supply for potential retailers. Other states have required distribution utilities to establish separate generation subsidiaries, with the idea that these new, independent entities would not have incentive to discriminate against retailers seeking power supplies at the wholesale level.³⁶ The staff of the New Hampshire Public Utilities

³⁴ See also our response to Question 1.

³⁵ Concerns about the growth of generation retail power through mergers or unfair competition are addressed by means of public and private enforcement of federal and state competition and consumer protection laws. The FTC, the US Department of Justice, FERC, the states, and private litigants address various concerns about increased market power and market manipulation.

³⁶ The establishment of independent grid operators helps to alleviate this concern by broadening the relevant geographic market. FERC's initial efforts to employ behavioral rules to prevent discrimination against independent generators seeking to supply retail marketers and distant utilities proved insufficient. Eventually, in Order No. 2000, FERC accepted arguments made by the FTC and others in support of structural (physical) unbundling of transmission from generation through the device of independent system operators and regional transmission organizations. The modern spread of organized wholesale electricity markets is consistent with the concerns

Commission suggested another reason to consider separating generation from distribution. The staff recommended separating distribution from generation used to serve POLR service customers because prices for POLR service from incumbent utility are spiraling upward. The staff noted that other generators could supply POLR service at lower and perhaps declining prices in the competitive wholesale power market, where more efficient generation designs and the use of alternative fuels have been holding costs and wholesale power prices in check in recent years.³⁷

There also can be threats to competition associated with how to recover stranded costs, which can arise when distribution utilities sell or reassess the value of generation assets. We have discussed some of these issues in previous FTC staff comments.³⁸

If the distribution utility also continues to sell power at the retail level, other competition and consumer protection concerns may arise. One such concern is the distribution utility's logo by its retail marketing affiliates. The FTC addressed these concerns (and described related original research) in a comment to the Public Utilities Commission of Nevada.³⁹

that the FTC expressed about transmission discrimination. The structural reforms – which resulted in fewer incentives and ways to use the transmission system to impede wholesale competition – alleviated some of the concerns over whether new retail marketers would be able to find attractive sources of supply and overcome concentration of local generation supplies. Conversely, concerns of this type would increase if there were transmission bottlenecks surrounding an area newly turning to retail electric competition. For an early discussion of the importance of competitive access to power supplies, see *Otter Tail Power Co. v. U.S.*, 410 U.S. 366 (1973).

³⁷ Staff of the New Hampshire Public Utilities Commission and The Liberty Consulting Group, “Public Service Company of New Hampshire: Report on Investigation into Market Conditions, Default Service Rate, Generation Ownership Impacts on the Competitive Electricity Market” 26 (June 7, 2013), available at <http://www.puc.nh.gov/Electric/IR%2013-020%20PSNH%20Report%20-%20Final.pdf>. (“All scenarios result in a default service rate above the rates currently offered by competitive supply . . . The results of the scenarios bear on the question of whether there is a point at which the default service rates would be considered no longer just and reasonable even though they are cost-based rates.”).

³⁸ FTC Staff Comment Before the Louisiana Public Service Commission Concerning Stranded Costs and Benefits (Aug. 7, 1998), available at <http://www.ftc.gov/be/v980018.shtml>; FTC Staff Comment Before the Michigan Public Service Commission Concerning Electric Restructuring (Aug. 7, 1998), available at <http://www.ftc.gov/be/v980019.shtml>

³⁹ FTC Staff Comment Before the Public Utilities Commission of Nevada Concerning Regulated Electric Utilities and Affiliates (Sept. 22, 1998), available at <http://www.ftc.gov/be/v980027.shtml>. Related concerns about the use of a utility logo on a price comparison website are described in “Market Advocates Testify to Texas PUC on CenterPoint’s

6. What, if any, features, entities or mechanisms must be in place in order for there to be an effective and efficient market structure for retail electric competition? How long would it take to implement these features, entities, or mechanisms?

We noted above that most retail choice states have found it useful to have clear mechanisms for (1) switching customers to new suppliers; (2) handling by suppliers; (3) licensing for new electricity marketers; and (4) handling joint billing by marketers and the distribution utilities. Retail competition regimes that have developed more active consumer involvement in switching suppliers also include a system for handling retail marketers'

states with retail electricity

If retail competition is effective in reducing reliance on flat-rate pricing, it is likely to enhance reliability by enrolling customers that help balance supply and demand on the power system. DR trims demand peaks and fills in demand troughs, which in turn eases the challenges that grid operators face. Further, retail competition allows marketers to offer improved reliability as a specific service. For example, marketers could offer installation and maintenance of energy storage devices or onsite generators that allow customers to have electric power when the grid is experiencing a blackout or local distribution lines are down. Fully regulated utilities have not generally sought or been allowed to offer individually tailored options outside of onsite renewable generation installations. Approaches to improve reliability proposed by consumer groups may be subject to challenge as violations of the distribution utility's monopoly franchise.⁴²

10. What are the issues relating to balancing area authorities, transmission planning, and control areas which must be addressed as part of a transition to retail electric competition?

As part of its consideration of retail competition, the ACC may wish to encourage Arizona's distribution utilities to broaden the geographic scope of their wholesale dispatch areas. Such a step could result in efficiencies in balancing renewable generation resources and in obtaining economies of massed reserves, as occurred in other areas of the country. We note in particular the decisions by utilities in Oregon and Nevada to work with the California Independent System Operator. The broadening of geographic dispatch areas could boost retail competition in Arizona by giving retail marketers a broader area (with more opportunities) in which to secure generation and transmission services for their retail customers at attractive prices.

Another issue is how the ACC will address resource adequacy questions under retail competition. Most states with retail competition operate within organized wholesale markets, most of which have adopted some type of capacity market mechanism to make up the revenues that generators lose under the price caps that the organized markets have adopted. The relative merits of capacity markets are beyond the scope of this comment, but reviews of this topic are available.⁴³

⁴² Michael Burr, "Economy of the Small," 151 *Pub. Util. Fortnightly* 20, 24 (May 2013).

⁴³ For example, Brattle Group prepared a review of resource adequacy policy alternatives for ERCOT that included a discussion of capacity markets. See "ERCOT Investment Incentives and Resource Adequacy" (June 1, 2012), available at <http://www.brattle.com/documents/UploadLibrary/Upload1047.pdf>

11. Among the states that have transitioned to retail electric competition, which model best promotes the public interest for Arizonans? Which model should be avoided?

The retail competition regimes of the various states evolve as conditions change, as regulatory innovations are tested, and as customers become more accustomed to selecting a power supplier that best serves their preferences. At this time, the development of retail electricity competition is probably most advanced in the portion of Texas in which ERCOT operates. The most important reason for this development is that distribution utilities are not assigned to provide POLR service in ERCOT. In part because of this feature, a higher proportion of retail customers in Texas than in

competition. Some other poor approaches include the inefficient allocation of costs to all power customers, when the benefits flow primarily to POLR customers; inattention to market power or price manipulation in wholesale power markets; and inattention to a few retailers' unfair practices that raise all retailers' marketing costs.

12. How have retail rates been affected in states that have implemented retail electric competition?

In general, as noted above, reference prices alone is not a reliable way to gauge performance under retail competition, because retail competition opens up opportunities to tailor the customer's choice of power service (including some costlier options that provide additional value) that were not present before. Customers prefer more or different services will often choose to pay higher per-unit prices for power because they are buying a differentiated (and preferred and more valuable) bundle of services instead of a commodity. Nevertheless, the most recent cross-state study of which we are aware reported that retail competition lowered retail power rates.⁴⁵ We have questions, however, about the sensitivity of the reported results to different interpretations of the data used in this study.⁴⁶

14. Is retail electric competition compatible with the Commission's Renewable Energy Standard that requires Arizona's utilities [to] serve at least 15% of their retail loads with renewable energy by 2025?

Several states that have re

requirements. This approach is appealing because it assures that renewable generation injected into the power system is sufficient to cover the LSE's RPS obligations, while it gives the LSE flexibility in complying with the RPS requirements. For example, an LSE could invest directly in renewable generation (with the right to issue RECs) or could buy RECs from other owners of renewable generation. This trading system approach has been workable in California, which has the highest RPS requirement, and several states in the PJM regional transmission organization area use RECs in their RPSs.

15. Is retail electric competition compatible with the Commission's Energy Efficiency Standard that requires Arizona's electric utilities to achieve a 22% reduction in retail energy sales by consumption by 2020?

Several states with retail competition regimes also have energy efficiency standards. There is nothing inherently inconsistent between retail competition and such standards.

16. How should the Commission address net metering in a competitive market?

The application of flat rate pricing in the context of net

reserves are low. Capacity markets provide revenue to make up for the “missing money” associated with bid caps.

The ERCOT area of Texas represents an ~~example~~ ^{exception} to the system of capacity markets and payments. Rather than employ a capacity market mechanism, ERCOT has relied on energy market revenues alone to stimulate timely ge