

**Federal Energy Regulatory Commission Technical Conference Re: Docket No. AD16-17-000:
Reactive Supply Compensation in Markets Operated by Regional Transmission
Organizations and Independent System Operators
June 30, 2016**

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**Comments of Dennis W. Bethel, Principal of Bethel Electric Rate Consulting, LLC
Re: Costs Incurred by Synchronous Generators for Reactive Supply**

From the beginning of the Open Access Transmission Service era, the Commission has recognized Reactive Supply and Voltage Control from Generation Sources (“Reactive Supply Service”) as a required Ancillary Service. Now, 20 years on, the Commission considers whether and how to change the requirements and remuneration for this still required service.

With minor adjustment, the method proposed in 1993 by AEP for allocating costs of its generating fleet, consisting mainly of coal-fired (88%) and nuclear (9%) generators, to Reactive Supply Service (“AEP Method”) has been the standard by which the Commission has evaluated subsequent filings by generation owners seeking to establish a revenue requirement for the fixed costs of Reactive Supply Service (the “Fixed Capability Costs”).¹ It was also recognized in that case, though not requested by AEP, that a generator could experience variable costs when providing Reactive Supply Service. The Commission clarified cost of service principles for applying the AEP Method, and for evaluating the variable “Heating Loss Costs” of Reactive Supply Service in subsequent cases (e.g., Dynegy Midwest Generation, Inc.).²

In Order 2003, the Commission established the policies, procedures, terms, conditions and agreements for large generator interconnection service, including minimum requirements for the capability of dispatchable generators to provide Reactive Supply Service (i.e., 0.9 PF lagging, and 0.95 PF leading).

In 2011, the U. S. Energy Information Administration (“EIA”) reported that natural gas-fired (mostly combined cycle) units comprised 81% (237 GW) of all generating plant capacity additions in the US between 2000 and 2010.³ The EIA now projects that during 2016, the majority of new capacity additions will be wind and solar powered (16.3 GW of 26.1 GW or 62%).⁴

Still, coal, natural gas and nuclear are the “Big Three” producers of electricity in America, supplying 86% of the US electrical energy supply in 2015.⁵

Given these trends, it is appropriate that the Commission investigate changing its policies for generators that have previously been exempted from the requirement to provide Reactive Supply Service, including what supply capability requirement such generators can meet, and at what costs.

I would caution, however, that there is no compelling reason to change policies with regard to synchronous generators, particularly if any changes would add further to the difficulties facing

¹ Opinion No. 440, issued July 30, 1999 in Docket No. ER93-540

² Opinion No. 498, issued October 12, 2007 in Docket No. EL05-72

³ <http://www.eia.gov/todayinenergy/detail.cfm?id=2070>

⁴ <http://www.eia.gov/todayinenergy/detail.cfm?id=25172>

⁵ Coal (33%), Gas (33%), Nuclear (20%), Hydro (6%), Other Renewables (7%) and Petroleum 1%, per FAQ at: <https://www.eia.gov/tools/faqs/faq.cfm?id=427&t=3>

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many central station generators to collect sufficient total revenues to earn a reasonable return on investment or to even remain solvent.

Wind and Solar may have recently become the new capacity of choice for a number of reasons, but they do not yet supply even 10% of the Nation's electricity. To upset well-established Reactive Supply Service ratemaking for existing generators because the time may have come for the wind and solar sector to develop a comparable (or otherwise feasible) Reactive Supply capability, would be to have the tail wag the dog.

The AEP Method was established as a way for existing utility-owned ("legacy") generators to allocate a small portion of their fixed costs (usually less than 2%) to Reactive Supply Service. The then existing generators and the many gas-fired generators built by utilities and Exempt Wholesale Generators in the late 1990's and 2000's were designed and built to provide significant Reactive Supply Service capability, a fact that permitted the Commission to implement the minimum reactive capability requirements of Order 2003. The costs of Reactive Supply Service capability from legacy and newer central station generators are embedded in the costs of the power plants, so it was and is completely appropriate that an allocation method, like the AEP Method, be applied to determine the Reactive Supply Service revenue requirements of those resources.

Non-synchronous power supply resources (e.g., wind, solar and storage) have so far been exempt from an obligation to provide Reactive Supply Service. As the Commission receives the information it needs to determine the latent capability of non-synchronous generators, when equipped with enabling technology, to provide Reactive Supply Service, it is also entirely appropriate that the Commission gather the information it needs to determine the incremental cost of developing and maintaining that capability, and consider whether a new ratemaking formulation is appropriate for these new resources.

Given the different circumstances and technology of synchronous and non-synchronous generators, the former having embedded costs for Reactive Supply Service and the latter having explorable incremental costs for Reactive Supply Service, it would not be *per se* problematic or even unusual if the Commission were to develop a new ratemaking mechanism to determine rates for Reactive Supply Service provided by non-synchronous generators while maintaining the existing ratemaking regime for synchronous generators.

Questions Re: Costs Incurred by Synchronous Generators for Reactive Supply

2.1 What costs do synchronous generators incur to install and maintain Reactive Supply capability?

- A. Synchronous generators have incurred embedded costs to possess Reactive Supply Service capabilities that, as discussed above, can be determined by presently approved methods.

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2.2 Is the equipment required for synchronous generators to maintain Reactive Supply capability the same as that required to produce and deliver real power, or must additional costs be incurred to provide Reactive Supply capability?

- A. Generators, exciters, some accessory electric equipment and generator step up transformers (“GSUT”) all must possess additional capability beyond that needed to supply the turbine-limited amount of Active Power in order to provide Reactive Supply Service. In addition, a small portion of the synchronous generator’s Active Power capability must be withheld to be able to meet the Reactive Supply Service obligation when called on to do so. The AEP Method appropriately captures both components of the Fixed Capability Costs of Reactive Supply Service for synchronous generators.

2.3 Would synchronous generators be designed or operated differently were it not for the Reactive Supply capability requirements of their respective Interconnection Agreements or Reactive Supply reliability requirements?

- A. If Reactive Supply Service capability requirements for synchronous generators were to be changed going-forward, it is possible, perhaps likely, that future designs of synchronous generators would be modified, but that would do nothing to change the embedded Reactive Supply Service capability costs of existing generators. The transmission system needs the dynamic Reactive Supply Service that synchronous generators supply, so the question is hypothetical, while the costs that have been incurred to support the grid are real.

2.4 What costs do synchronous generators incur in real-time to provide Reactive Supply service?

- A. When called on to provide Reactive Supply Service, the synchronous generator incurs incremental generator, exciter and GSUT losses that reduce net output capability. The Commission permits recovery of actual fuel costs incurred for Reactive Supply Service.

2.5 How are the costs required for synchronous generators to maintain Reactive Supply capability and to provide Reactive Supply service recovered?

- A. It varies by region, but, in the main, the costs incurred by synchronous generators to possess and maintain Reactive Supply Service capabilities are recovered through monthly collection of an established revenue requirement for Fixed Capability Costs (based on the AEP Method) and, in some cases, charges for Heating Loss Costs.

2.6 Would any departures from the current methods of cost recovery for Reactive Supply Service by synchronous generators be appropriate?

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Present trends in the electric power industry do not warrant significant departures from the current methods of cost recovery for Reactive Supply Service from synchronous generators. That said, I would share a few observations regarding refinements that could be appropriate in the implementation of the present methods. The focus of the following comments is to improve clarity, comparability, and to ensure that costs related to Reactive Supply Service are recovered from transmission customers benefiting from the ancillary service as opposed to power customers of the generators, as those two groups are generally not exactly the same.

Whether efforts to ensure that Reactive Supply Service revenue requirements are appropriately adjusted as generating units are retired or de-rated are being comparably implemented throughout the industry is a question that may need to be considered.

The rated reactive power capability of existing units should not be reduced for purposes of determining revenue requirements on the basis insubstantial evidence of impairment, for example when test results are impacted by testing restrictions.

A review of the methods of providing compensation to generators that provide Reactive Supply Service beyond the amount reflected in Fixed Capability Cost payments in response to a system operator's instruction, focusing on whether generators are comparably compensated throughout the industry is encouraged. Reasonable compensation for each occurrence of such incremental service could reflect the sum of actual variable costs and a Fixed Capability Cost component (perhaps reflective of the hourly or daily cost of alternative reactive power supplies, e.g., synchronous generators or SVC), but also should not be less than the value of any foregone sales.

Finally, comparable start-up cost compensation should be available to any generator that was not committed to service by the operating authority prior to the time it became needed as a reactive power source, but is brought on-line to provide Reactive Supply Service at the system operator's instruction.