Reactive Issues

RCPTF

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IMM

Monitoring Analytics

Reactive Basics

- Reactive supply and voltage control from generation service is an ancillary service defined in Order 888
- Providing reactive capability within defined power factors is a condition of interconnecting to PJM
- Payments for reactive include reactive capability and reactive opportunity costs
- Payments for reactive capability are defined in Schedule 2 of the OATT
- Payments for each resource approved separately by FERC.
  - Fleet rates, plant rates and unit rates

Reactive Facts

- **Payments for reactive capability were $351 million in 2021**
- **The average cost of reactive capability is about $2,000 per MW-year**
- **The revenues for reactive capability currently included in the capacity market demand curve (VRR curve) as part of the energy and ancillary services offset (EAS) are $2,199 per MW-year.**

Reactive Issues

- Reactive capability payments are side payments made to generators as out of market payments
- Reactive capability payments are based on an illogical and arbitrary cost of service allocation
- Reactive capability is part of the capability of generating units
- The cost of reactive capability is indistinguishable from the other costs of generating capacity
- There is no reason to continue to make cost of service payments to resources in the PJM market

Cost of Service Allocation

- There is no identifiable part of a generating unit uniquely associated with producing reactive.
- In order to be able to assert that a part of the cost of an integrated generating plans is associated with reactive, an allocation method is required.
- In 1999, AEP developed such an allocation method, now called the AEP method
- The AEP method was developed and applied in a fully cost of service regulated environment
- The purpose was solely to assign some reactive payments to transmission and some to generation.

AEP Method

- Cost of service allocations are based on judgment
- Primary allocation factor is the power factor
  - Allocation factor is subjective
  - Allocation factor has nothing to do with the actual costs incurred to provide reactive

AEP Method

- The power factor is the ratio of real power (MW) to the total output (apparent power) of a generator (megavolt-amperes or MVA).
- The remaining output is reactive power (megavolt amperes reactive or MVAR).
- The allocator typically used by proponents of the *AEP* Method to assign costs to reactive power generation is (1 – (PowerFactor)^2).
- For a power factor of .95, the allocator is 9.75 percent
- For a power factor of .90, the allocator is 19.00 percent
- For a power factor of .70, the allocator is 51.00 percent

Power Factors

- The typical actual operating power factor of generators in PJM is determined by their voltage schedule and is usually between .97 and .99.
- The resultant *AEP* Method power factor allocator is 5.91 to 1.99 percent.
- The nameplate power factor of thermal generating units is typically .85.
- The resultant *AEP* Method power factor allocator is 27.75 percent.
- But that does not mean that 27.75 percent of the plant capital costs are associated with reactive power.

Power Factor

- **The power factor does not measure reactive capability.**
- **The power factor does not determine a plant's reactive capability.**
- **The power factor does not identify costs associated with reactive capability or provide a reasonable basis for allocating those costs to reactive or real power production.**

Results of AEP Method

- The results of the AEP method demonstrate how significantly the cost of service approach distorts the PJM markets.
- Recent reactive cases include requests for guaranteed reactive cost of service payments for renewable resources that are greater than the market price of capacity for those resources.
- Renewable resources have requested fully half of the total capacity cost of individual plants.
- There is a wide disparity in the rates paid to generators for the same service as a result of the inefficient FERC staff review process.

Reactive Design

- **The fundamental question is whether market design in the organized wholesale markets requires separate, guaranteed cost of service compensation for reactive capability.**
- **The answer is no.**
- **In the PJM market design, investment in resources is fully recoverable through markets.**
- **Supporters of the cost of service approach have never explained why a nonmarket approach is required in PJM or why it is preferable to a market approach.**

Reactive Design

- **The current process is an inefficient waste of time because it relies on an atavistic regulatory paradigm that is not relevant in the PJM market framework.**
- **There is no reason to include complex rules that arbitrarily segregate a portion of a resource's capital costs as related to reactive power and that require recovery of that arbitrary portion through guaranteed revenue requirement payments based on burdensome cost of service rate proceedings.**
- **The practice persists in PJM only because it provides a significant, guaranteed stream of riskless revenue.**

Reactive Design

- **Payments based on cost of service approaches result in distortionary impacts on PJM markets.**
- **Elimination of the reactive revenue requirement and recognition that capital costs are not distinguishable by function would increase prices in the capacity market.**
- **The VRR curve would shift to the right, the maximum VRR price would increase and offer caps in the capacity market would increase.**
- **The simplest way to address this distortion would be to recognize that all capacity costs are recoverable in the PJM markets.**

Reactive revenue requirements: 12.31.2021

Unit Type	Fuel Type	Total Revenue Requirement per Year	MW	Number of Resources	Requirement per MW-year
CC	Gas	$128,050,591.74	50,346.2	158	$2,543.40
CT	Gas	$49,415,243.93	28,664.0	258	$1,723.95
CT	Oil	$4,870,245.73	3,640.5	137	$1,337.80
Diesel	Gas	$1,380,092.00	105.8	5	$13,044.35
Diesel	Oil	$1,028,792.65	168.3	36	$6,112.85
Diesel	Other - Gas	$940,634.85	122.5	13	$7,678.65
FC	Gas	$45,000.00	2.6	1	$17,307.69
Hydro	Water	$18,160,605.09	6,920.8	53	$2,624.06
Nuclear	Nuclear	$53,552,998.67	32,655.9	31	$1,639.92
Solar	Solar	$1,844,502.44	299.1	13	$6,166.84
Steam	Coal	$62,385,763.44	47,164.4	79	$1,322.73
Steam	Gas	$4,275,392.92	4,434.4	19	$964.14
Steam	Oil	$5,032,169.50	4,583.4	11	$1,097.91
Steam	Other - Solid	$340,000.00	34.0	2	$10,000.00
Steam	Wood	$207,759.31	153.0	3	$1,357.90
Wind	Wind	$19,590,962.81	4,681.6	36	$4,184.67
Total		$351,120,755.09	183,976.5	855	$1,908.51

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