

134 FERC ¶ 61,124  
UNITED STATES OF AMERICA  
FEDERAL ENERGY REGULATORY COMMISSION

18 CFR Part 35

Frequency Regulation Compensation in the  
Organized Wholesale Power Markets

Docket Nos. RM11-7-000  
AD10-11-000

(February 17, 2011)

AGENCY: Federal Energy Regulatory Commission.

ACTION: Notice of Proposed Rulemaking.

SUMMARY: The Federal Energy Regulatory Commission (Commission) is proposing to revise its regulations to remedy undue discrimination in the procurement of frequency regulation service in the organized wholesale electricity markets. The emergence of technologies capable of responding more quickly than the generators that have historically provided frequency regulation service has prompted the Commission to evaluate market rules to ensure that they are not unduly discriminatory or fail to provide just and reasonable compensation for the service being provided. If found, the Commission proposes to remedy the undue discrimination by requiring a uniform price for regulation capacity paid to all cleared resources and a performance payment for the provision of frequency regulation, with such payment reflecting a resource's accuracy of performance. This proposed action helps to ensure that market rules do not present unnecessary barriers to the participation of all resource types in the wholesale ancillary services markets. The Commission seeks comment on the proposed regulations.

DATES: Comments are due 60 days after publication in the **FEDERAL REGISTER**

ADDRESSES: You may submit comments, identified by docket number by any of the following methods:

- Agency Web Site: <http://ferc.gov>. Documents created electronically using word processing software should be filed in native applications or print-to-PDF format and not in a scanned format.
- Mail/Hand Delivery: Commenters unable to file comments electronically must mail or hand deliver their comments to: Federal Energy Regulatory Commission, Secretary of the Commission, 888 First Street, NE, Washington, DC 20426.

FOR FURTHER INFORMATION CONTACT:

Robert Hellrich-Dawson (Technical Information)  
Office of Energy Policy & Innovation  
888 First Street, NE  
Washington, DC 20426  
(202) 502-6360  
[bob.hellrich-dawson@ferc.gov](mailto:bob.hellrich-dawson@ferc.gov)

Eric Winterbauer (Legal Information)  
Office of the General Counsel  
888 First Street, NE  
Washington, DC 20426  
(202) 502-8329  
[eric.winterbauer@ferc.gov](mailto:eric.winterbauer@ferc.gov)

SUPPLEMENTARY INFORMATION:

134 FERC ¶ 61,124  
UNITED STATES OF AMERICA  
FEDERAL ENERGY REGULATORY COMMISSION

Frequency Regulation Compensation in the  
Organized Wholesale Power Markets

Docket Nos. RM11-7-000  
AD10-11-000

NOTICE OF PROPOSED RULEMAKING

(February 17, 2011)

1. Pursuant to section 206 of the Federal Power Act (FPA),<sup>1</sup> the Commission is proposing to revise its regulations to ensure just, reasonable and not unduly discriminatory or preferential rates in the procurement of frequency regulation in the organized wholesale electric markets. Maintaining the frequency of the transmission system within an acceptable range is critical to reliable operations. Historically, generators have provided the power to regulate or correct frequency deviations. Non-traditional technologies that have the capability to respond quickly and accurately to certain transmission system needs are being deployed in regional transmission organization (RTO) and independent system operator (ISO)<sup>2</sup> markets to varying degrees. Resources such as large-scale battery systems, flywheels, electric vehicle-to-grid (V2G)

---

<sup>1</sup> 16 U.S.C. 824e (2006). *Accord* 16 U.S.C. 824d (providing that rates must be just and reasonable).

<sup>2</sup> The following RTOs and ISOs have organized wholesale electricity markets: PJM Interconnection, LLC (PJM); New York Independent System Operator, Inc. (NYISO); Midwest Independent Transmission System Operator, Inc. (Midwest ISO); ISO New England Inc. (ISO-NE); California Independent System Operator Corp. (CAISO); and Southwest Power Pool, Inc. (SPP).

systems, and demand-side processes have the ability to ramp<sup>3</sup> up or down faster than some traditional resources and, as such, are able to provide frequency regulation services more accurately than traditional resources.<sup>4</sup>

2. Taking advantage of the capabilities of faster-ramping resources can improve the operational and economic efficiency of the transmission system and has the potential to lower costs to consumers in the organized wholesale energy markets.<sup>5</sup> However, current compensation methods for regulation service in ISO and RTO markets may not acknowledge the inherently greater amount of Area Correction Error (ACE)<sup>6</sup> correction

---

<sup>3</sup> “Ramping” or the ability to “ramp” is traditionally defined as the ability to change the output of real power from a generating unit per some unit of time, usually measured as MW/minute. A generator ramps up to produce more energy and ramps down to produce less. A storage device ramps up by discharging energy and ramps down by charging. A demand response resource, in the context of the provision of frequency regulation, ramps up by consuming less energy, and ramps down by consuming more.

<sup>4</sup> In this instance, the ability to provide more accurate frequency regulation service means to follow the system operator’s dispatch signal more closely.

<sup>5</sup> See *infra* n.32-33 and corresponding text.

<sup>6</sup> ACE comprises two components, one measuring the difference between a balancing authority’s scheduled and actual interchange, and another measuring the balancing authority’s share in correcting the frequency of the interconnection. In order to keep ACE within acceptable ranges, entities will pre-schedule resources in anticipation of load changes and use frequency regulation resources to make up the difference. The frequency regulation resources are sent a signal to increase or decrease their provision of energy (or discharge or charge in the case of a storage device, or consume more or less energy in the case of a demand response resource). This is done through what is known as Automatic Generation Control (AGC). Because the Balancing Area Authority must respond rapidly to correct ACE deviations, fast responding resources are particularly well-suited to maintaining system frequency.

being provided by faster-ramping resources.<sup>7</sup> Frequency regulation is the tool used to manage ACE. In addition, some RTOs currently provide unit-specific opportunity cost payments to regulating resources rather than incorporate the marginal resource's opportunity cost into the uniform market clearing price, resulting in an economically inefficient economic dispatch.

3. The Commission is concerned that frequency regulation compensation practices may be resulting in rates that are unjust and unreasonable and unduly discriminatory or preferential. Therefore, the Commission proposes to require regional RTOs and ISOs to adopt tariff revisions that will ensure that resources providing frequency regulation service are appropriately compensated.<sup>8</sup> The Commission seeks public comment on these proposed reforms.

---

<sup>7</sup> Both existing market participants and potential entrants are affected by inefficient pricing. It is possible that existing market participants would offer faster ramping capabilities to the system operator in response to a pricing scheme that recognized the service this provides.

<sup>8</sup> This NOPR is limited to the RTOs and ISOs. In an RTO/ISO region (except SPP, which currently does not have a frequency regulation market), the frequency regulation market is designed to select and compensate the resources needed to provide frequency regulation service. The RTO/ISO market design sends a price signal in order to incent particular resource behavior that leads to the reliable, least-cost provision of frequency regulation. By contrast, in non-RTO/ISO regions, frequency regulation is provided by the transmission provider on a cost-of-service basis through Schedule 3, with the transmission provider selecting the mix of resources it uses to provide frequency regulation service.

## **I. Background**

### **A. Frequency Regulation Service**

4. Frequency regulation service is the injection or withdrawal of real power by facilities capable of responding appropriately to a transmission system's frequency deviations or interchange power imbalance, both measured by the ACE. When generation dispatch does not equal actual load and losses on a moment-by-moment basis, the imbalance will result in the grid's frequency deviating from the standard (60 Hertz). Minor frequency deviations affect energy consuming devices; major deviations cause generation and transmission equipment to separate from the grid, in the worst case leading to a cascading blackout. Frequency regulation service can prevent these adverse consequences by rapidly correcting deviations in the transmission system's frequency to bring it within the acceptable range.<sup>9</sup>

5. Frequency regulation is distinguishable from Frequency response.<sup>10</sup> Frequency response involves the automatic, autonomous and rapid action of turbine governor control to change a generator's output and of technically capable demand response resources that can automatically change consumption to respond to changes in frequency. These changes occur independent of any dispatch signal from a system operator. Frequency

---

<sup>9</sup> A balancing authority achieves acceptable ranges by being in compliance with Control Performance Standards 1 and 2 as defined in the Commission-approved Reliability Standard BAL-001-0.1a.

<sup>10</sup> On January 20, 2011, the Commission released for public comment a staff study evaluating the use of frequency response metrics as a tool to assess the reliability impacts of varying resource mixes on the transmission grid.

regulation service, in contrast, requires a dispatch signal sent by the system operator to those resources capable of and dispatched to provide frequency regulation service.

6. Today, frequency regulation is largely provided by generators (e.g., water, steam and combustion turbines) that are specially equipped for this purpose. Provision by other resources is emerging, as technologies develop and tariff and market rules are appropriately adapted to accommodate new resources. For example, the Electric Reliability Council of Texas (ERCOT) and Midwest ISO currently use controllable demand response in addition to generators to provide frequency regulation service.<sup>11</sup> Such “regulation capable” generation, storage devices, and demand response resources can respond automatically to signals sent by the RTO or ISO, through AGC, to increase or decrease real power injections or withdrawals to correct frequency deviations or interchange schedule imbalance, as measured by the ACE. The faster a resource can ramp up or down, the more accurately it can respond to the AGC, or ACE correction, signal

---

<sup>11</sup> In Midwest ISO, Alcoa’s Warrick metallurgic induction (smelting) operation provides approximately 70 MW of frequency regulation. Alcoa Comments, Docket AD10-11-000, at 2 (June 16, 2010). In ERCOT’s model, controllable loads are a type of Load Acting as a Resource (LaaR) that is capable of reducing or increasing consumption under dispatch control (similar to AGC) and able to immediately respond proportionally to frequency changes (similar to generator governor action) to provide Ancillary Services. See Electric Reliability Council of Texas, *Controllable Load Resource Qualification* (2007), available at <http://www.ercot/content/services/programs/load/laar/Controllable%20Load%20Resource%20Qualification.doc>.”

and avoid overshooting ACE correction needs.<sup>12</sup> When a resource ramps too slowly, its ramping limitations may cause it to work against ACE correction needs and force the system operator to commit additional regulation resources to compensate.

**B. Current ISO and RTO Practices**

7. In the ISO and RTO markets, compensation for frequency regulation service is presently based on several components. Depending on the ISO or RTO, these payments include consideration for capacity set aside to provide the service, as well as some of the following: the net energy the resource injects into the system; accurately following the ISOs or RTOs dispatch signal; and/or the absolute (rather than net) amount of energy injected or withdrawn. These payments are intended to cover the range of costs incurred in order to provide this service: operation and maintenance costs for providing frequency regulation and loss of potential revenue from foregone sales of electricity.

8. With regard to the payment for capacity set aside, this is essentially an option payment<sup>13</sup> to the resource to keep a certain amount of capacity out of the energy market in order to provide frequency regulation service (based on a market clearing price per MW of capacity sold). ISO-NE, NYISO, Midwest ISO, and PJM incorporate into this

---

<sup>12</sup> *Frequency Regulation Compensation in the Organized Wholesale Power Markets*, Technical Conference, Beacon Speaker Materials, Docket No. AD10-11-000, at Figure 3 (May 26, 2010), which shows the difference between ISO-NE's ACE control signal, Beacon's flywheel response, and the allowable response rate under current ISO-NE rules. Here, "allowable response rate" means the rate at which the resource must respond to be considered in compliance with the dispatch signal.

<sup>13</sup> This type of capacity payment, based on day-ahead offers to sell ancillary services, is distinguishable from a long-term capacity payment such as provided for in PJM's reliability pricing model or ISO-NE's forward capacity market.

payment the opportunity cost of foregone energy sales incurred by a resource that provides frequency regulation service; though in ISO-NE and PJM, opportunity costs are not applied uniformly to all cleared resources.

9. Compensation for regulation service also generally includes payments for the net energy the resource injects into the system. RTOs and ISOs currently provide a payment for the net energy injected by a resource providing regulation service during the operating hour, calculated as the amount of energy injected less energy withdrawn multiplied by the real-time energy price.

10. Accuracy of performance can be incorporated into payments for regulation service. Currently, NYISO incorporates accuracy into its compensation for regulation service through a penalty that reflects the accuracy with which the resource follows its dispatch instruction.<sup>14</sup> This is done through a performance index that tracks how accurately a resource follows the dispatch signal.<sup>15</sup>

11. ISO-NE makes payments for regulation service to reflect the amount of work performed by a resource by reflecting the absolute amount of energy injected and withdrawn. Regulating resources receive a “mileage” payment that reflects the amount of ACE correction provided.<sup>16</sup>

---

<sup>14</sup> NYISO, Market Services Tariff, § 15.3.5.5.

<sup>15</sup> NYISO uses telemetry data to track how closely a frequency regulation resource’s output is to the dispatch signal. NYISO then weights the resource’s payments to reflect its accuracy. For example, if the resource’s response falls outside an acceptable range 10 percent of the time, for a performance index of 0.9, it will receive 90 percent of its payment.

<sup>16</sup> ISO-NE, Transmission, Markets and Services Tariff, § III.3.5.5.

12. In general, when a resource submits its bid, the bid is typically required to include its ramp rate in MW per minute, its cost per MWh of ramping ability, and the total capacity it is offering for frequency regulation.<sup>17</sup> The resource's total amount of capacity is based on and limited by its ability to ramp up or down in 5 minutes.<sup>18</sup> For example, a resource with a relatively large amount of capacity, but a relatively slow ramp rate would be limited in how much capacity it could offer as regulation. If the resource can ramp one MW per minute, it would only be able to offer 5 MW of regulation capacity (for a five minute dispatch) even if it has a total capacity of many hundreds of megawatts. On the other hand, a smaller capacity, fast-ramping resource might not face such a constraint. For instance, a storage device that can hold a 20 MW charge and ramp at 10 MW per minute, could offer its full 20 MW of capacity for five minutes.

13. Some RTOs and ISOs are actively discussing changes to their frequency regulation markets or stated at the technical conference that changes might be appropriate.<sup>19</sup> For example, CAISO has recently approved a new Regulation Energy

---

<sup>17</sup> See, e.g., NYISO, *Ancillary Services Manual, Manual 2*, at 4-8 (Nov. 2010).

<sup>18</sup> A resource's capacity is limited by the amount it can ramp in 5 minutes because the system operator in most RTOs and ISOs dispatch resources every 5 minutes. CAISO dispatches every 10 minutes, and so a frequency regulation resource's capacity in that market is bound by the total capacity it can ramp in 10 minutes.

<sup>19</sup> See PJM, *Market and Reliability Committee Meeting Materials*, (Jan. 2011), <http://www.pjm.com/~media/committees-groups/committees/mrc/20110119/20110119-item-05-regulation-market-performance-incentive-problem-statement-clean.ashx>.

Management proposal.<sup>20</sup> Likewise, the Commission is aware that ISO-NE is preparing new rules for frequency regulation compensation to formalize the participation of energy storage devices, something that has been only a pilot project to date.<sup>21</sup>

**C. Commission Inquiries into Faster-Ramping Resources**

14. The Commission began its inquiry into faster-ramping resources in May 2010. On May 26, 2010, the Commission hosted a publicly noticed technical conference<sup>22</sup> inviting various stakeholders, including representatives from the RTOs and ISOs, industry, and academia to share their views on whether current frequency regulation market designs reflect the value of the service provided, and whether the use of faster-ramping resources for frequency regulation has the potential to provide benefits to the organized markets. Interested parties were permitted to file comments after the technical conference. Separately, the Commission on June 11, 2010 issued a request for comments regarding potential approaches to categorizing storage service for compensation purposes.<sup>23</sup>

---

<sup>20</sup> CAISO, Board of Governors, Decision on Regulation Energy Management (Feb. 3, 2011), available at <http://www.caiso.com/2b1a/2b1acd6d20610.pdf>.

<sup>21</sup> ISO-NE, *Report of ISO New England Inc. Regarding the Implementation of Market Rule Changes to Permit Non-Generating Resources to Participate in the Regulation Market*, Docket No. ER08-54-014, at 5 (Dec. 17, 2010).

<sup>22</sup> See Final Agenda, *Frequency Regulation Compensation in the Organized Wholesale Power Markets*, Docket No. AD10-11-000 (May 26, 2010).

<sup>23</sup> *Request for Comments Regarding Rates, Accounting and Financial Reporting for Electric Storage Technologies*, Docket No. AD10-13-000 (June 11, 2010).

## 1. Market Design and the Value of the Service Provided

15. With regard to market designs for frequency regulation service, participants at the technical conference generally agreed that compensation for regulating resources ought to reflect the service they perform for the system operator. However, there was disagreement regarding whether current market designs accomplish this objective. Some current market design features were cited as resulting in efficient price signals and appropriately differentiating between the amount of ACE correction that is provided by different regulating resources,<sup>24</sup> while others were said to be deficient.<sup>25</sup>

16. At the technical conference and in written comments, Beacon Power Corporation (Beacon) provided data on the amount of ACE correction provided by a faster-ramping resource relative to the generator response allowable under the ISO tariff.<sup>26</sup> According to Beacon's analysis of resources performing in the ISO-NE market, it is possible for a faster-ramping resource to provide more frequency regulation service than a slower-ramping resource. Beacon presents data showing, over a one hour period, a faster-ramping resource providing a total of 0.48 MWh of movement in response to the system operator's dispatch signal. If this same signal had been sent to a slower-ramping resource, it could have provided only 0.18 MWh and still been within ISO-NE's allowable response rate.

---

<sup>24</sup> Tr. 93: 2-5 (Walawalkar); Tr. 103: 6-10 (Capp).

<sup>25</sup> Tr. 72: 1-11 (Ott).

<sup>26</sup> Beacon, Technical Conference Speaker Materials, at 7, Data from 1 MW in ISO-NE Alternative Regulation Pilot (May 26, 2010) (attached hereto as Appendix A).

17. In addition, under certain circumstances a slower-ramping resource could actually be working against the system operator's need for ACE correction, so that only a portion of the energy produced positively contributes to correcting the ACE signal. By contrast, the faster-ramping resource can respond to the system's control needs more exactly. In the example discussed above, the allowed generator response produces 0.18 MWh, but 0.07 MWh of that is working against the system's ACE correction needs because of its slow-ramping capability. Therefore, only 0.11 MWh (61 percent) actually contributes to correcting ACE. At the same time, the fast-ramping resource is being dispatched more often and all of the energy it produces helps to correct ACE. Both resources are considered, from the perspective of ISO-NE's current tariff, to be 100 percent accurate, even though at times the slower-ramping resource is working against the system operator's ACE control needs.

18. In this example, Beacon asserted that the fast-ramping resource actually is providing more than four times as much ACE correction relative to the allowable response from an existing generator providing frequency regulation. With the exception of ISO-NE, the RTOs and ISOs limit compensation to frequency regulation resources to a capacity payment and net energy balancing. ISO-NE includes a payment for the amount of frequency service provided. As a result, these ISOs and RTOs would pay the fast-ramping resource and the slow-ramping resource the same amount, assuming both resources set aside the same amount of capacity to provide the service.

19. During the technical conference, PJM stated that it has no compensation structure for how much it asks a resource to move when providing frequency regulation and, as a result, it is likely under-compensating resources for speed and accuracy.<sup>27</sup>

20. On the other hand, representatives of Midwest ISO and NYISO indicated that they believe their current market designs are sufficient, because the amount of regulating capacity a resource is allowed to sell is based on its ramp rate, so faster-ramping resources are allowed to sell more regulating capacity.<sup>28</sup>

21. Alcoa noted that MISO and NYISO's rationale is only relevant to resources that are ramp constrained. Alcoa stated that its demand response-based regulating resource is capacity constrained, but not ramp constrained. Alcoa added that because Midwest ISO and NYISO both net the regulation up and regulation down that a regulating resource provides, neither compensates for the resource's actual ramping contribution. As a result, Alcoa's fast ramp rate does not allow it to sell any additional regulating capacity, and Alcoa has no incentive to bid into the market its true ability to ramp, instead offering a lower ramp rate.<sup>29</sup>

---

<sup>27</sup> Tr. 84:9-16 (Ott), 72:1-11 (Ott).

<sup>28</sup> Tr. 72-73 (Ramey); Tr. 132: 8-11 (Ramey); Tr. 75-77 (Pike).

<sup>29</sup> Tr. 68:13-22 (Todd).

22. Several entities responding to the June request for comments also addressed market design issues for frequency regulation service.<sup>30</sup> These commenters argue that the market should place a monetary value on the service provided by the speed and accuracy with which certain storage technologies can respond to a regulation signal. Commenters also identified the potential benefits of using faster-ramping resources to provide frequency regulation service.<sup>31</sup>

## **2. Potential Cost and Reliability Benefits**

23. Participants at the technical conference stated that the use of faster-ramping resources for frequency regulation has the potential to provide benefits to the organized markets. These benefits include allowing RTOs and ISOs to use less regulation capacity to meet current NERC standards, thus lowering regulation costs.<sup>32</sup> Further, use of faster-ramping resources frees slower-ramping resources to operate at stable output levels and,

---

<sup>30</sup> Beacon, Comments, Docket No. AD10-13-000, at 8 (Aug. 9, 2010); NEMA, Comments, Docket No. AD10-13-000, at 2 (Aug. 9, 2010); Xtreme Power, Comments, Docket No. AD10-13-000, at 5 (Aug. 9, 2010); A123 Systems, Comments, Docket No. AD10-13-000, at 5-7 (Aug. 9, 2010); ESA, Comments, Docket No. AD10-13-000, at 2 (Aug. 9, 2010); NAATBatt, Comments, Docket No. AD10-13-000, at 4-5 (Aug. 9, 2010).

<sup>31</sup> MegaWatt Storage Farms Comments Docket No. AD10-13-000, at 8-9 (Aug. 9, 2010); Xtreme Power, Comments, Docket No. AD10-13-000, at 2-3 (Aug. 9, 2010); A123 Systems, Comments, Docket No. AD10-13-000, at 4 (Aug. 9, 2010); ESA, Comments, Docket No. AD10-13-000, at 2 (Aug. 9, 2010).

<sup>32</sup> Tr. 35-36 (Ott); Tr. 30-31 (Kathpal); Tr. 37-39 (Ramey).

therefore, at more efficient heat rates which allows them to submit lower bids into energy markets, thereby lowering energy prices.<sup>33</sup>

24. To illustrate the efficiency of faster-ramping resources, some industry representatives – during the technical conference and in comments – referred to a Pacific Northwest National Laboratory study that examined the ability of faster-ramping resources to replace traditional generation resources in providing frequency regulation service in the CAISO.<sup>34</sup> The study defined an “ideal resource” as one that has a ramp rate equal to its entire capacity in one minute. The study’s authors determined the ramping ability for various resource types in the current CAISO generation fleet that provide frequency regulation service, including hydro, combustion turbine, steam turbine, and combined cycle. The authors then estimated how many megawatts of these types of capacity can be replaced by 1 MW from an ideal resource. In one case, the ideal resource was assumed to have no limits on its ability to sustainably provide energy. In a second case, the resource’s ability to sustain energy reflects the actual ability of a flywheel, i.e., it reflects an energy-limited resource. In either case, the authors concluded that a faster-responding resource is able to provide more effective regulation capacity than most other resources, including the current generation fleet mix in the CAISO. When replacing these resources for frequency regulation service with an ideal resource, the authors found that 1 MW of an ideal resource with limited energy could replace 1.43 MW of an average

---

<sup>33</sup> *Id.*

<sup>34</sup> Makarov, Y.V., Ma, J., Lu, S., and T.B. Nguyen, “Assessing the Value of Regulation Resources Based on Their Time Response Characteristics,” Pacific Northwest National Laboratory, PNNL-17632, June 2008.

hydro unit. The authors state that effectiveness increases as the ideal resource is compared to even slower ramping resources, reaching a maximum when 1 MW of an ideal resource with limited energy replaces more than 24 MW of an average steam turbine. Compared to the current CAISO fleet mix providing frequency regulation, which includes fast-responding hydro units, the authors found that 1 MW of a limited energy ideal resource could replace 1.17 MW of the current generation mix.

25. Representatives from some RTOs and ISOs, however, questioned at the technical conference whether procuring more fast-response resources would materially improve their ability to meet NERC ACE control performance standards.<sup>35</sup> For example, ISO-NE and NYISO acknowledged that using a combination of faster-responding resources has allowed them to meet their NERC standards by procuring relatively less regulation capacity than they would otherwise need.<sup>36</sup>

## II. Discussion

### A. The Need for Reform

26. The Commission proposes to adopt a frequency regulation compensation mechanism, as set forth below, for compensating regulation providers in organized wholesale electricity markets in order to eliminate undue discrimination and ensure just

---

<sup>35</sup> For example, NERC reliability requirement CPS1 requires each balancing authority to operate within a specific limit, taking into consideration clock-minute averages of ACE, frequency bias, and interconnection frequency error. NERC reliability requirement CPS2 requires each balancing authority to operate such that its average ACE is within a specific limit, during a calendar month, for at least 90 percent of clock-ten-minute periods.

<sup>36</sup> Tr. 49:2-14 (Pike); Tr. 53:24-25 (Potishnak).

and reasonable rates. Faster-ramping resources provide more ACE correction to system operators than slower ramping resources and are, at least in some RTOs and ISOs, explicitly given priority in the dispatch order. Yet these resources do not appear to be receiving compensation for all of the service they provide as a result of pricing mechanisms that may be unduly discriminatory. Further, the Commission believes there are market efficiencies to be gained by ensuring efficient price signals for regulation resources that forego the opportunity to earn revenues in the energy markets.

### 1. Unduly Discriminatory Pricing

27. The Commission is concerned that current rules that govern pricing and compensation for frequency regulation services in RTOs and ISOs may be unjust and unreasonable because faster-ramping resources are compensated at the same level as slower ramping resources, even though they can respond more quickly and provide more ACE correction.<sup>37</sup>

28. Specifically, the Commission is concerned that under some existing frequency regulation compensation methods, a faster-ramping resource may not be compensated for

---

<sup>37</sup> See *Promoting Wholesale Competition Through Open Access Non-Discriminatory Transmission Services by Public Utilities; Recovery of Stranded Costs by Public Utilities and Transmitting Utilities*, Order No. 888, 61 FR 21540, at 21569 (May 10, 1996), FERC Stats. & Regs. ¶ 31,036 (1996), *order on reh'g*, Order No. 888-A, 62 FR 12274 (Mar. 14, 1997), FERC Stats. & Regs. ¶ 31,048, *order on reh'g*, Order No. 888-B, 81 FERC ¶ 61,248 (1997), *order on reh'g*, Order No. 888-C, 82 FERC ¶ 61,046 (1998), *aff'd in relevant part sub nom. Transmission Access Policy Study Group v. FERC*, 225 F.3d 667 (D.C. Cir. 2000), *aff'd sub nom. New York v. FERC*, 535 U.S. 1 (2002) (“In the context of an emerging competitive market in generation, discriminatory practices that once did not constitute undue discrimination must be reviewed to determine whether they are being used to prevent the benefits of competition in generation from being achieved.”).

all of the service it provides. For example, CAISO, NYISO, Midwest ISO, and PJM net the regulation up and regulation down provided by resources. This compensation method does not acknowledge the inherently greater amount of ACE correction being provided by faster-ramping resources.<sup>38</sup> As a result, slower-responding resources are compensated as if they are providing the same amount of ACE correction when, in reality, they are not.

29. Some ISOs and RTOs dispatch faster-ramping resources earlier than other resources to take advantage of their enhanced operation capabilities, i.e., their ability to ramp faster, yet pay all resources at the same rate, i.e., the same clearing price for capacity and the same price per MWh of net energy.<sup>39</sup> Again, this could lead to providing different amounts of ACE correction, yet receiving the same compensation due to netting practices.

30. The Commission acknowledges that a resource's ability to sell capacity into the regulation market is dependent on its ramping ability, such that a faster-responding resource is able to offer a relatively greater amount of capacity. This does not, however,

---

<sup>38</sup> A simplified example would be to consider two resources that clear with the same amount of capacity and are directed to provide regulation up and regulation down over the course of a five-minute interval. The fast-ramping resource might be directed, for example, to move around an initial set-point up five MW, then down three MW, up one MW, down ten MW, and finally up nine MW. A netting approach to compensation would determine that the resource provided an additional two MW of energy to the system ( $+ 5 - 3 + 1 - 10 + 9 = +2$ ) during that five minute interval. Meanwhile, a slower-ramping resource may be directed to move up three MW and then down one MW for a net of two MW in relation to its set-point. The operator is not able to direct more movement because the slower-ramping resource would not be able to respond in the requisite timeframe. Both resources would receive identical compensation for their movement, despite the first resource providing more ACE correction.

<sup>39</sup> See, e.g., Tr. 83:9-24 (Ramey).

alleviate our concerns about potential undue discrimination toward resources that provide more ACE correction. For example, some new market entrants are relatively small in terms of capacity (capacity-constrained), but are capable of responding rapidly to AGC signals (not ramp-constrained), so a compensation scheme that does not reflect work performed will lead to inadequate compensation when compared to larger, slower responding generators.<sup>40</sup> The Commission preliminarily finds that slower, larger resources are being given a compensatory advantage for their size while faster, smaller resources do not similarly receive compensation for their ramping speed. The Commission believes compensation should take into account the greater amount of service that is being provided by faster-ramping resources, through more frequent provision of both up and down regulation; this greater amount of ACE correction is lost when positive and negative contributions to ACE correction are netted and no additional payment is made to reflect performance. Therefore, the Commission proposes to reform current market designs that lack a payment that reflects the amount of ACE correction

---

<sup>40</sup> A resource that is capacity constrained but is able to ramp at a very high rate will clear its relatively small amount of capacity in the regulation market and then be paid for providing regulation service in real-time. But this performance payment does not acknowledge ramping ability due to netting. On the other hand, a ramp constrained resource with a large amount of capacity to sell could clear its relatively large amount of regulation capacity (and, thus, receive a higher capacity payment) and get paid at the same rate for providing regulation service in real-time. Expanding the hypothetical scenario provided above, *see supra* n.37, assume that the first (faster) resource is capacity constrained and can offer only 10 MW of regulation, while the second (slower) resource, while ramp-constrained, can offer 30 MW of regulation. The 30 MW resource will receive a larger capacity payment for offering more regulation, but the two resources will receive identical net payments for their actual movement if they are directed as indicated above. In other words, the slower, larger resource receives a compensatory advantage for its size, but the faster, smaller resource does not similarly receive a compensatory advantage for its ramping speed.

provided by a resource, thereby under-compensating faster-ramping resources when compared to payments made to slower-ramping resources.

31. Additionally, the Commission believes that the manner in which some resources that provide frequency regulation service are compensated for their opportunity costs may be unjust and unreasonable and unduly discriminatory.<sup>41</sup> For instance, PJM provides ex post “make whole” payments based on individual unit opportunity costs, something that is not reflected in the uniform market clearing price calculation.<sup>42</sup> ISO-NE pays opportunity costs on a resource-specific basis. Both of these methods have the potential to inefficiently select regulating resources and also fail to reflect the marginal unit’s full marginal cost (including opportunity cost) that should set the market clearing price that is paid to all cleared suppliers. In addition, as is noted by ISO-NE in comments submitted after the technical conference, failing to pay a uniform clearing price that includes the marginal unit’s opportunity costs could result in inefficient price signals being sent that will result in inappropriate long-term investment.<sup>43</sup> Therefore, the Commission proposes to require that all resource bids include opportunity costs and that all cleared frequency regulation resources be paid the single market clearing price, which will reflect the total marginal costs of the marginal cleared unit. We believe that this

---

<sup>41</sup> By participating in the regulation market, an energy market resource is dispatched at a set-point below its maximum capacity. Because this amount of capacity is held in reserve to provide regulation, the resource misses the opportunity to provide energy at the current LMP.

<sup>42</sup> PJM, *Manual 18: Operating Agreement Accounting*, at 12-16, available at <http://www.pjm.com/~media/documents/manuals/m28.ashx>.

<sup>43</sup> ISO-NE Comments at 8.

proposal will result in just and reasonable rates and correct potential undue discrimination.

## 2. Potential Market Efficiencies

32. The Commission preliminarily finds that the use of faster-ramping resources for frequency regulation has the potential to improve operational and economic efficiency and, in turn, lower costs to consumers in the organized markets. As described above, faster-ramping resources may be able to replace resources that currently provide frequency regulation, so RTOs and ISOs may be able to procure less regulation capacity, thereby lowering costs to load. This can be seen in both ISO-NE and NYISO. Both have a relatively higher concentration of faster-ramping resources, easily meet NERC reliability standards, and yet procure less regulation capacity, as a percentage of peak load, than other RTOs and ISOs.<sup>44</sup> When dispatching faster-ramping resources, the system operator is better able to rely on those resources to quickly and accurately follow the AGC signal, without overshooting, thus avoiding the need for additional regulation resources to compensate.

33. The Commission also anticipates a secondary effect on energy markets: as slower ramping resources move out of the frequency regulation market and are able to focus on providing sustained energy, they should be able to operate at more efficient heat rates.<sup>45</sup> For example, for traditional thermal generators, providing frequency regulation results in

---

<sup>44</sup> See Tr. 53:24-25 (Potishnak), Tr. 54:1-2 (Potishnak), Tr. 49:6-14 (Pike).

<sup>45</sup> Participants at the May 26, 2010 technical conference noted that it was unlikely that any frequency regulation market would comprise only fast-ramping storage resources due to the need for sustained energy. Tr. 23:8-25 (Pike).

both operating at inefficient heat rates and additional wear and tear on equipment.<sup>46</sup> If these modes of operation are avoided, costs can be reduced and lower energy bids offered, thereby lowering prices in the energy market. The Commission notes that, at the May 2010 technical conference, some participants questioned the value of procuring only faster-ramping, but short duration resources, for frequency regulation. Accordingly, the Commission seeks comment on the benefits that faster-ramping resources, no matter their exact type, can and do bring to the RTO and ISO markets. Likewise, the Commission seeks comments on the drawbacks of using faster-ramping resources, if any.<sup>47</sup>

### **B. Specific Proposals**

34. In light of the foregoing concerns the Commission proposes to amend its regulations to provide a frequency regulation compensation mechanism for the RTO and ISO markets to ensure that pricing and compensation of frequency regulation service is just and reasonable and not unduly discriminatory or preferential. Specifically, the Commission proposes to require ISOs and RTOs to change their tariffs so that regulation resources receive a two-part payment. This two-part payment structure is based on what the Commission preliminarily finds are “best practices” used by the RTOs and ISOs. As further described below, the first part of the payment is a capacity, or option, payment to

---

<sup>46</sup> Xcel Energy’s Pawnee coal plant shows maintenance and capital costs (i.e., wear and tear) for load following of approximately \$1.5k per load following cycle. Aptech Engineering Services, Inc., *Cost of Cycling Analysis for Pawnee Station Unit 1 Phase 1: Top-Down Analysis*, at vii (November 2008), available at <http://www.xcelenergy.com/SiteCollectionDocuments/docs/CRPEXhibit4CostofCyclingExecutiveSummary.pdf>.

<sup>47</sup> Tr. 28:13-24 (Potishnak); Tr. 40:9-15 (Ott).

have a certain amount of capacity held in reserve and not participate in the energy market in order to provide frequency regulation service. While all RTOs and ISOs with a centrally-procured frequency regulation market currently provide for a capacity payment to frequency regulation resources, the payment varies by RTO or ISO. To produce the efficient market outcome, this payment must include the marginal regulating resource's opportunity costs. The second part of the payment is a performance payment based on the amount of up and down movement, in megawatts, the resource provides in response to a control signal.<sup>48</sup> This performance payment should also take into consideration a resource's accuracy in providing ACE correction. The Commission preliminarily finds that this compensation structure is necessary to ensure that pricing schemes for frequency regulation service in the organized wholesale electricity markets result in rates that are just and reasonable, and not unduly discriminatory or preferential.

### **1. Capacity Payment and Opportunity Cost**

35. The Commission proposes to require that each regulating resource is paid a uniform capacity payment that includes the opportunity cost of the marginal regulating resource. As discussed above, some ISOs and RTOs currently pay resource-specific opportunity costs in addition to or as part of a capacity payment, while others incorporate the marginal unit's opportunity cost into a uniform frequency regulation market clearing price for capacity. In order to send an efficient price signal to frequency regulation resources, the Commission proposes that RTOs and ISOs base the clearing price for

---

<sup>48</sup> This applies whether an RTO or ISO allows resources to sell regulation up and regulation down separately or requires resources to offer both regulation up and regulation down.

frequency regulation on the marginal resource's marginal cost, including opportunity cost. Paying a unit-specific opportunity cost distorts the market by basing the commitment of regulating units on incomplete market information, potentially leading to committing units with higher costs than other units not committed. Accordingly, the Commission preliminarily finds that a frequency regulation compensation mechanism that includes a uniform clearing price with accurately-determined opportunity costs will reduce errors in selecting the optimal portfolio of regulation suppliers each hour (and each day), which reduces total regulation costs to consumers and ensures that rates are just and reasonable and not unduly discriminatory or preferential.

36. In addition, the Commission preliminarily finds that cross-product opportunity costs<sup>49</sup> should be calculated by the RTO or ISO, as it has the best information to determine a frequency regulation resource's cross-product opportunity cost due to not participating in the energy market. Further, where appropriate, resources should be permitted to include inter-temporal opportunity costs in their capacity bid.<sup>50</sup> The Commission seeks comment on its proposal to require each regulating resource to be paid

---

<sup>49</sup> A cross-product opportunity cost, in this case, is the revenue a regulation provider loses because it is on stand-by to provide regulation and is not providing energy.

<sup>50</sup> An inter-temporal opportunity cost represents the foregone value when a resource must operate at one time, and therefore must either forego a profit from selling energy at a later time or incur costs due to consuming at a later time. The trade-off presented to thermal storage provides an example of inter-temporal opportunity costs. A thermal storage operator would prefer to "charge" (heat bricks or freeze water) when prices are low. If such a resource were to provide frequency regulation, it could be asked to stop charging during low price periods and then be forced to charge during high price periods.

a uniform capacity payment that includes the opportunity cost of the marginal regulating resource.

## **2. Payment for Performance with Accuracy Adjustment**

37. The Commission preliminarily finds that requiring a component in the frequency regulation compensation mechanism that recognizes the resource's contribution to ACE correction is necessary to remedy undue discrimination and ensure just and reasonable rates in the organized wholesale electricity markets. Resources that provide more value to the grid by doing more of the work to correct ACE deviations should be paid more than resources doing less work. Accordingly, taking performance into consideration is a key element of ensuring that any frequency regulation compensation mechanism is just and reasonable and not unduly discriminatory or preferential. We, therefore, propose to require that all regulating resources be paid for their performance, with this payment taking the form of a payment for each MW, up or down, provided by the resource in response to the system operator's dispatch signal. Specifically, an RTO or ISO would determine the total movement up and down and then multiply that sum by a price-per-MW of ACE correction. We seek comment on the proposed method and whether there are alternative payments for performance that can address our concern about undue discrimination.

38. The Commission proposes that the price-per-MW of ACE correction be market-based. Specifically, resources would specify the capacity (in MW) available to provide regulation, a ramp rate (in MW/minute), and bid into the market a price-per-MWh ramping capability and price-per-MW of ACE correction. The RTO or ISO would then determine the least cost set of resources and set the price-per-MW of ACE correction

based on the bid of the marginal regulating resource. We note that there was little discussion at the technical conference about how to design the price-per-MW of ACE correction.<sup>51</sup> The alternative to a market-based price is to use an administratively set price-per-MW of ACE correction. We seek comment on this proposal as well as the alternative of an administratively determined price, including how an administratively determined price could be set. We note that some commenters stressed the importance of the ISO's and RTO's energy and ancillary service co-optimization algorithms in producing the least-cost portfolio of resources.<sup>52</sup> We therefore seek comment on how this proposal will integrate with the ISO's and RTO's existing co-optimization algorithms.

39. The Commission also proposes that the performance payment must reflect the resource's accuracy in following the system operator's dispatch signal. Specifically, we propose that the accuracy be measured by the RTO or ISO using currently available telemetry technology. If an RTO or ISO receives telemetry data every 10 seconds, for instance, it would be able to measure over the course of 5 minutes how often the resource was delivering exactly the megawatts requested. The resource would then be compensated for the fraction of its energy injected or withdrawn that met the dispatch signal. This method accepts as given the resource's stated ramping ability and provides a

---

<sup>51</sup> *See, e.g.*, Tr.124:10-131:19.

<sup>52</sup> EPISA Comments at 9-10 (“Going forward co-optimization and how that is evaluated will be important to generation resources because the rules that result will play an important role in determining whether and when the resource will provide energy or ancillary services.”).

disincentive to deviate from the dispatch signal, which incorporates actual ramping performance.

40. We note that there was little agreement among the technical conference panelists on how accuracy should be incorporated into the frequency regulation market design.<sup>53</sup> Therefore, we seek comments on alternative methods, including methods to incorporate accuracy into the ACE correction calculation. It is possible to approximate how a resource contributes to correcting ACE by taking the difference between the energy it provides that was in the direction needed to correct ACE at any moment and the energy that was in the direction opposite to what was needed to correct ACE. If ACE indicates that the system requires regulation up, yet a resource is still providing regulation down due to its slow ramping ability, that resource could be considered to not be contributing to ACE correction. Thus, its payment for ACE correction would only include the MWh that were actually correcting ACE. The Commission seeks comments on how to structure payments for frequency regulation that compensate a resource for its contribution to ACE correction. We seek comment on whether this method could result in a resource being penalized through lower measured ACE correction even when it is following the system operator's dispatch signal.

### **3. Net Energy**

41. Currently, regulating resources receive a payment (or charge) for the net energy injected (or withdrawn) as a result of providing regulation service in every RTO and ISO market. The Commission seeks comment on the appropriateness of retaining net energy

---

<sup>53</sup> See Tr. 85-86 (Potishnak) and Tr. 117-118 (Ott).

payments in light of the two-part payment proposed here. Specifically, the Commission seeks comment on whether the provisions in existing tariffs for net energy payments are redundant given the proposed requirement discussed herein that all RTOs and ISOs must pay regulating resources a mileage payment for the ACE correction they provide, or whether this payment is a necessary, appropriate feature of day-ahead and real-time energy account balancing and settlement.

### **III. Information Collection Statement**

42. The following collection of information contained in this Proposed Rule are subject to review by the Office of Management and Budget (OMB) under section 3507(d) of the Paperwork Reduction Act of 1995.<sup>54</sup> OMB's regulations require approval of certain information collection requirements imposed by agency rules.<sup>55</sup> The Commission solicits comments on the Commission's need for this information, whether the information will have practical utility, the accuracy of the burden estimates, ways to enhance the quality, utility, and clarity of the information to be collected or retained, and any suggested methods for minimizing respondents' burden, including the use of automated information techniques.

43. Additionally, the Commission encourages comments regarding the time burden expected to be required to comply with the proposed rule regarding the requirement for ISOs and RTOs to change their tariffs so that the regulation resources receive just and reasonable compensation for the services provided, and the potential time burden on

---

<sup>54</sup> 44 U.S.C. 3507(d) (2006).

<sup>55</sup> 5 C.F.R. 1320.11 (2010).

regulation resources to conform to new or modified bidding requirements. Specifically, the Commission seeks comment on: (1) the additional burden and cost (human, hardware and software) associated with implementation, operation and maintenance of this new provision in ISO/RTO tariffs; and (2) the additional burden and cost (human, hardware and software) on regulation resources, if any, associated with changes to the type of information submitted in the bid or the manner in which the bid is submitted.

Burden Estimate: The additional estimated public reporting burdens for the proposed reporting requirements in this rule are as follows.

<b>Data Collection</b>	<b>Number of Respondents<sup>56</sup></b>	<b>Number of Responses</b>	<b>Hours per Response</b>	<b>Total Annual Hours</b>
<b>FERC 516</b>	<b>[1]</b>	<b>[2]</b>	<b>[3]</b>	<b>[1 X 2 X 3]</b>
Conforming tariff changes (18 CFR 35.28(g)(3)). One time burden.	5	1	100	500
<b>Totals</b>				<b>500 one time burden</b>

Cost to Comply: The Commission has projected the cost of compliance to be \$57,000.

Total Annual Hours for Collection in initial year (500 hours) @ \$114 an hour [average cost of attorney (\$200 per hour), consultant (\$150), technical (\$80), and administrative support (\$25)] = \$57,000

Title: FERC-516, Electric Rate Schedules and Tariff Filings

Action: Proposed Collection.

---

<sup>56</sup> SPP is not included in the respondents because they currently do not have a frequency regulation compensation mechanism in their tariff and independent of this proceeding they have indicated that they are already planning to implement such a mechanism. Therefore, it is expected that any additional burden on SPP due to this proceeding is expected to be *de minimus*.

OMB Control No. 1902-0096

Respondents for this Rulemaking: Businesses or other for profit and/or not-for-profit institutions.

Frequency of Information: As indicated in the table.

Necessity of Information: The Federal Energy Regulatory Commission is proposing to require ISOs and RTOs to change their tariffs to provide for compensation of frequency regulation in a manner that remedies undue discrimination in the procurement of such service in the organized wholesale electricity markets.

Internal Review: The Commission has reviewed the proposed changes and has determined that the changes are necessary. These requirements conform to the Commission's need for efficient information collection, communication, and management within the energy industry. The Commission has assured itself, by means of internal review, that there is specific, objective support for the burden estimates associated with the information collection requirements.

44. Interested persons may obtain information on the reporting requirements by contacting the following: Federal Energy Regulatory Commission, 888 First Street, NE, Washington, DC 20426 [Attention: Ellen Brown, Office of the Executive Director], e-mail: [DataClearance@ferc.gov](mailto:DataClearance@ferc.gov), Phone: (202) 502-8663, fax: (202) 273-0873.

45. Comments on the collections of information and the associated burden estimates in the proposed rule should be sent to the Commission in this docket and may also be sent to the Office of Information and Regulatory Affairs, Office of Management and Budget, DC 20503 [Attention: Desk Officer for the Federal Energy Regulatory Commission].

For security reasons, comments to OMB should be submitted by e-mail to:

oira\_submission@omb.eop.gov. Comments submitted to OMB should include Docket Number RM11-7 and OMB Control Number 1902-0096.

#### **IV. Environmental Analysis**

46. The Commission is required to prepare an Environmental Assessment or an Environmental Impact Statement for any action that may have a significant adverse effect on the human environment.<sup>57</sup> The Commission has categorically excluded certain actions from this requirement as not having a significant effect on the human environment.<sup>58</sup> The proposed regulations are categorically excluded as they address rate filings submitted under section 206 of the FPA and the establishment of just and reasonable rates, terms and conditions of jurisdictional service under this section of the FPA.<sup>59</sup> Accordingly, no environmental assessment is necessary and none has been prepared for this NOPR.

#### **V. Regulatory Flexibility Act**

47. The Regulatory Flexibility Act of 1980 (RFA)<sup>60</sup> generally requires a description and analysis of final rules that will have significant economic impact on a substantial number of small entities. The RFA mandates consideration of regulatory alternatives that accomplish the stated objectives of a proposed rule and that minimize any significant

---

<sup>57</sup> *Regulations Implementing the National Environmental Policy Act*, Order No. 486, 52 FR 47897 (Dec. 17, 1987), FERC Stats. & Regs. Preambles 1986-1990 ¶ 30,783 (1987).

<sup>58</sup> 18 CFR 380.4.

<sup>59</sup> *See* 18 CFR 380.4(a)(15).

<sup>60</sup> 5 U.S.C. 601-612.

economic impact on a substantial number of small entities. The Small Business Administration's (SBA) Office of Size Standards develops the numerical definition of a small business.<sup>61</sup> The SBA has established a size standard for electric utilities, stating that a firm is small if, including its affiliates, it is primarily engaged in the transmission, generation and/or distribution of electric energy for sale and its total electric output for the preceding twelve months did not exceed four million megawatt hours.<sup>62</sup> Five ISOs and RTOs, not small entities, are impacted directly by this rule.

48. CAISO is a non-profit organization with over 54,000 megawatts of capacity and over 25,000 circuit miles of power lines.

49. NYISO is a non-profit organization that oversees wholesale electricity markets, dispatches over 500 generators, and manages a nearly 11,000-mile network of high-voltage lines.

50. PJM is comprised of more than 600 members including power generators, transmission owners, electricity distributors, power marketers, and large industrial customers, serving 13 states and the District of Columbia.

51. Midwest ISO is a non-profit organization with over 145,000 megawatts of installed generation. Midwest ISO has over 57,000 miles of transmission lines and serves 13 states and one Canadian province.

---

<sup>61</sup> 13 CFR 121.101.

<sup>62</sup> 13 CFR 121.201, Sector 22, Utilities & n.1.

52. ISO-NE is a regional transmission organization serving six states in New England. The system is comprised of more than 8,000 miles of high-voltage transmission lines and over 350 generators.

53. The Commission certifies this rule will not have a significant economic impact on a substantial number of small entities, and therefore no initial regulatory flexibility analysis is required.

## **VI. Comment Procedures**

54. The Commission invites interested persons to submit comments on the matters and issues proposed in this notice to be adopted, including any related matters or alternative proposals that commenters may wish to discuss. Comments are due **60** days from publication in the **FEDERAL REGISTER**. Comments must refer to Docket No. RM11-7-000, and must include the commenter's name, the organization they represent, if applicable, and their address in their comments.

55. The Commission encourages comments to be filed electronically via the eFiling link on the Commission's web site at <http://www.ferc.gov>. The Commission accepts most standard word processing formats. Documents created electronically using word processing software should be filed in native applications or print-to-PDF format and not in a scanned format. Commenters filing electronically do not need to make a paper filing.

56. Commenters that are not able to file comments electronically must send an original to: Federal Energy Regulatory Commission, Secretary of the Commission, 888 First Street, NE, Washington, DC 20426.

57. All comments will be placed in the Commission's public files and may be viewed, printed, or downloaded remotely as described in the Document Availability section below. Commenters on this proposal are not required to serve copies of their comments on other commenters.

## **VII. Document Availability**

58. In addition to publishing the full text of this document in the Federal Register, the Commission provides all interested persons an opportunity to view and/or print the contents of this document via the Internet through the Commission's Home Page (<http://www.ferc.gov>) and in the Commission's Public Reference Room during normal business hours (8:30 a.m. to 5:00 p.m. Eastern time) at 888 First Street, NE, Room 2A, Washington, DC 20426.

59. From the Commission's Home Page on the Internet, this information is available on eLibrary. The full text of this document is available on eLibrary in PDF and Microsoft Word format for viewing, printing, and/or downloading. To access this document in eLibrary, type the docket number excluding the last three digits of this document in the docket number field.

60. User assistance is available for eLibrary and the Commission's website during normal business hours from FERC Online Support at (202) 502-6652 (toll free at 1-866-208-3676) or email at [ferconlinesupport@ferc.gov](mailto:ferconlinesupport@ferc.gov), or the Public Reference Room at (202) 502-8371, TTY (202)502-8659. E-mail the Public Reference Room at [public.referenceroom@ferc.gov](mailto:public.referenceroom@ferc.gov).

List of subjects in 18 CFR Part 35

Electric power rates, Electric utilities, Reporting and recordkeeping requirements.

By direction of the Commission. Commissioner Spitzer dissenting in part with a separate statement attached.

( S E A L )

Kimberly D. Bose,  
Secretary.

In consideration of the foregoing, the Commission proposes to amend Part 35 Chapter I, Title 18 of the *Code of Federal Regulations* as follows:

**PART 35 – FILING OF RATE SCHEDULES AND TARIFFS**

1. The authority citation for Part 35 continues to read as follows:

**Authority:** 16 U.S.C. § 791a-825r, 2601-2645; 31 U.S.C. § 9701; 42 U.S.C. § 7101-7352.

2. Amend § 35.2 as follows:

Add a new paragraph (g).

**§ 35.2 Definitions.**

\* \* \* \* \*

(g) *Frequency regulation.* The term *frequency regulation* as used in this part will mean the capability to inject or withdraw real power by resources capable of responding to a balancing area’s frequency deviations or interchange power imbalance, measured by the Area Control Error.

3. Amend § 35.28 as follows:

Add a new paragraph (g)(3) .

**§ 35.28 Non-discriminatory open access transmission tariff.**

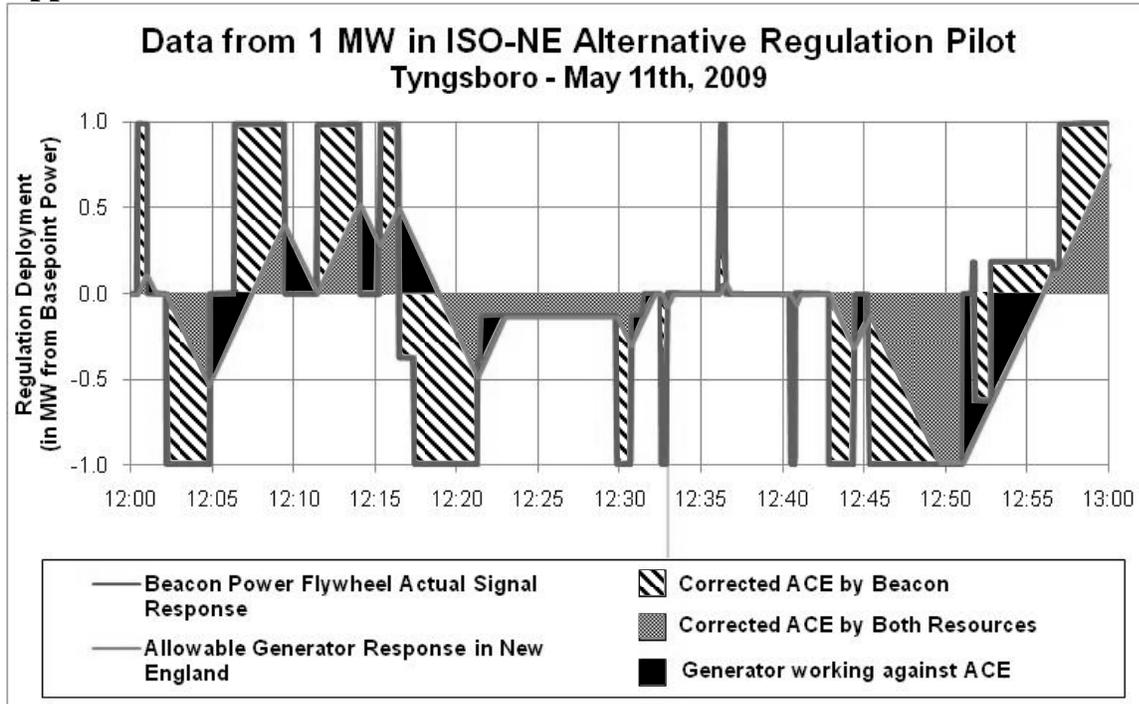
\* \* \* \* \*

(g) \* \* \*

(3) Frequency regulation compensation in ancillary services markets. Each Commission-approved independent system operator or regional transmission

organization that has a tariff that provides for the compensation of frequency regulation must provide such compensation based on the actual service provided, including a capacity payment that includes the marginal unit's opportunity costs and a payment for performance that reflects a frequency regulating resource's contribution to correcting the relevant balancing area's Area Control Error (when the resource is accurately following the dispatch signal) when providing regulation service.

**Appendix A**



Source: Beacon, technical Conference Speaker Materials, at 7 (May 26, 2010).

UNITED STATES OF AMERICA  
FEDERAL ENERGY REGULATORY COMMISSION

Frequency Regulation Compensation in the  
Organized Wholesale Power Markets

Docket Nos. RM11-7-000  
AD10-11-000

(Issued February 17, 2011)

SPITZER, Commissioner, *dissenting in part*:

In the Notice of Proposed Rulemaking, the majority is concerned that current mechanisms for compensating frequency regulation service in regional transmission organization (RTO) and independent system operator (ISO) regions may not adequately compensate for the true value of the frequency regulation service provided. I share the majority's concern. Resources that have faster-ramping capability have the potential to respond quicker and more accurately to certain transmission system needs.

However, the majority concludes, based on the existing record, that the Commission should require a standard formula through which all RTO/ISO regions must compensate frequency regulation service. I believe the record is not adequate to propose a specific proposal at this time. Accordingly, I believe the Commission should have taken a preliminary step (such as the issuance of a Notice of Inquiry or Advanced Notice of Proposed Rulemaking) before moving forward with the specific proposal in a Notice of Proposed Rulemaking.

I disagree with the majority that the record is sufficiently robust to make a specific proposal at this time to change our regulations. Although the record provides some data regarding potential reliability and efficiency benefits of faster-ramping resources providing frequency regulation service, I am concerned this evidence may be incomplete.<sup>1</sup> In the existing record, several commenters raise concerns about the lack of hard data; these commenters argue that more study is needed to demonstrate incremental value.<sup>2</sup> Even RTO/ISOs examining these issues express reservations that the evidence may be inadequate to support the conclusions asserted in the NOPR.<sup>3</sup>

---

<sup>1</sup> Compare Notice of Proposed Rulemaking at P 16-18, P 24 with Transcript of May 26, 2010 Technical Conference (Transcript) at 24:2-16 (Pike); Transcript at 18:13-25 and 29-1-21 (Potishnak).

<sup>2</sup> Electric Power Supply Association (EPSA) June 16, 2010 Comments at 2; Xcel Energy Services Inc. (XES) June 16, 2010 Comments at 3, 5-7; Transcript at 59:15-24 (Lowell); Transcript at 124:4-9 (Pike).

<sup>3</sup> Notice of Proposed Rulemaking at P 25; ISO New England Inc. (ISO-NE) June

The May 26, 2010 Staff Technical Conference and subsequent outreach provided some feedback on these issues. However, I am concerned that the limited participation from entities other than the RTOs/ISOs and non-traditional technologies undermines the record on which to base a change to our regulations. There are “traditional” resources, such as pumped-storage hydro and certain combustion turbine resources that provide this type of “faster-ramping” service,<sup>4</sup> but we have received only limited feedback from these types of resources so far. In addition, there may be proponents of new technologies that we have not heard from whose role with regard to frequency regulation may warrant a different change to our regulations than proposed in the Notice of Proposed Rulemaking. Initiation of a Notice of Inquiry or Advanced Notice of Proposed Rulemaking may better allow evidence regarding those technologies.

Appropriately, the Notice of Proposed Rulemaking asks questions to develop a more complete record. However, the nature of the questions posed is an indication that we should do more prior to issuing a specific proposal. While the Notice of Proposed Rulemaking asks some generic questions in this regard, the majority fails to address the concerns already in the record about co-optimization,<sup>5</sup> sustainability<sup>6</sup> and potential limitations of faster-ramping resources.<sup>7</sup>

Moreover, I believe there is no basis to propose a single, one-size-fits-all approach for frequency regulation compensation. In fact, several commenters caution specifically

---

16, 2010 Comments at 5-6; California Independent System Operator Corporation (CAISO) June 16, 2010 Comments at 2-3.

<sup>4</sup> ISO-NE June 16, 2010 Comments at 4-6; Transcript at 14:18-22 (Masiello); Transcript at 49:3-14 (Pike).

<sup>5</sup> Notice of Proposed Rulemaking at P 38; EPSA June 16, 2010 Comments at 9-10; Southern Company Services, Inc. (Southern) June 16, 2010 Comments at 6-8; Southern California Edison Company (SCE) June 16, 2010 Comments at 3.

<sup>6</sup> Notice of Proposed Rulemaking at P 33; ISO-NE June 16, 2010 Comments at 5; EPSA June 16, 2010 Comments at 6-8; XES June 16, 2010 Comments at 5; Transcript at 15:13-15 (Potishnak); Transcript at 18:18-25 and 19:1-5 (Ramey); Transcript at 23:18-25 and 24:1 (Pike); Transcript at 75:15-25 and 76:4 (Pike); Transcript at 86:18-20 (Potishnak).

<sup>7</sup> Notice of Proposed Rulemaking at P 33, n.51; ISO-NE June 16, 2010 Comments at 5; EPSA June 16, 2010 Comments at 8-9; Transcript at 17:20-25 (Ramey); Transcript at 73:4-16 (Ramey).

against such an approach.<sup>8</sup> In addition, I have concerns that the majority decision could detract from, or otherwise delay, efforts ongoing at the RTO/ISO stakeholder level.<sup>9</sup>

It is essential that this Commission address frequency regulation compensation to ensure appropriate compensation for service provided. Moreover, new technologies could offer substantial benefits. While I recognize the majority's desire to move quickly, I believe it is more important to "measure twice, cut once." Accordingly, I believe the Commission should have taken a preliminary step (such as the issuance of a Notice of Inquiry or Advanced Notice of Proposed Rulemaking) before moving forward with the specific proposal in a Notice of Proposed Rulemaking. For these reasons, I respectfully dissent in part from this Order.

---

Marc Spitzer  
Commissioner

---

<sup>8</sup> ISO-NE June 16, 2010 Comments at 7-8; SCE June 16, 2010 Comments at 2,5; Southern June 16, 2010 Comments at 3.

<sup>9</sup> Notice of Proposed Rulemaking at P 13; SCE June 16, 2010 Comments at 3-4; CAISO June 16, 2010 Comments at 1-2.