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| NPRR Number | [1273](https://www.ercot.com/mktrules/issues/NPRR1273) | NPRR Title | Appropriate Accounting for ESRs in PRC Calculation |
| Date Posted | | February 12, 2025 | |
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| Requested Resolution | | Urgent – The current calculation for Physical Responsive Capacity (PRC) may not provide sufficient time for load shed once the trigger for Energy Emergency Alert (EEA) Level 3 is met. | |
| Nodal Protocol Sections Requiring Revision | | 6.5.7.5, Ancillary Services Capacity Monitor | |
| Related Documents Requiring Revision/Related Revision Requests | | None | |
| Revision Description | | This Nodal Protocol Revision Request (NPRR) modifies the capacity from Energy Storage Resources (ESRs) included in the calculation of PRC to be the amount that can be sustained for 45 minutes. | |
| Reason for Revision | | [Strategic Plan](https://www.ercot.com/files/docs/2023/08/25/ERCOT-Strategic-Plan-2024-2028.pdf) Objective 1 – Be an industry leader for grid reliability and resilience  [Strategic Plan](https://www.ercot.com/files/docs/2023/08/25/ERCOT-Strategic-Plan-2024-2028.pdf) Objective 2 - Enhance the ERCOT region’s economic competitiveness with respect to trends in wholesale power rates and retail electricity prices to consumers  [Strategic Plan](https://www.ercot.com/files/docs/2023/08/25/ERCOT-Strategic-Plan-2024-2028.pdf) Objective 3 - Advance ERCOT, Inc. as an independent leading industry expert and an employer of choice by fostering innovation, investing in our people, and emphasizing the importance of our mission  General system and/or process improvement(s)  Regulatory requirements  ERCOT Board/PUCT Directive  *(please select ONLY ONE – if more than one apply, please select the ONE that is most relevant)* | |
| Justification of Reason for Revision and Market Impacts | | North American Electric Reliability Corporation (NERC) Reliability Standard EOP-011 specifies that a Balancing Authority will declare EEA Level 3 when a system’s operating reserves are less than its Most Severe Single Contingency (MSSC) as defined by NERC, and will immediately take actions, including manual load shed, adequate to mitigate this emergency.  Under normal conditions, ERCOT procures sufficient Responsive Reserve Service (RRS) and other Ancillary Services to avoid the need for manual or under-frequency load shed to meet these requirements. As long as these Ancillary Services are preserved, then the EOP-011 standard (as well as other standards related to timely frequency recovery and recovery of contingency reserves) can be met.  However, during tight operational conditions when demand approaches the available supply, these Ancillary Services reserves are released to be used as needed to provide energy to meet Demand. During these periods, the calculation of PRC becomes critically important, as it is the value which is monitored to determine the level of operating reserves that are available to implement the EOP-011 standard.  During these conditions, ERCOT monitors PRC and will implement EEA Level 3 and shed firm load if PRC drops below 1,500 MW and is not expected to recover within 30 minutes. When ERCOT orders Transmission Operators (TOs) to implement load shed, they have up to 30 minutes to implement their share of that load shed amount. ERCOT will also order load shed based on defined low frequency triggers which are used as a backstop in case the telemetered capacity values used for PRC are inaccurate.  Therefore, the primary purpose of the calculation of PRC is to provide an indication of how much capacity is available to respond to a unit trip during these scarcity conditions when no other capacity is available.  With the inclusion of limited-duration ESRs on the ERCOT System, another consideration is whether the capacity included in PRC has sufficient State of Charge (SOC) to replace the capacity lost from the MSSC until load shed can be implemented.  The current calculation of PRC includes capacity from ESRs that is able to be sustained for 15 minutes. While this was tied to the duration for the provision of Primary Frequency Response, when the value of PRC becomes most important, the calculation of PRC should include the capacity from ESRs that is able to be sustained long enough to allow time for load to be shed and not just what is needed to support frequency. This value must be greater than the 30 minutes allowed for load shed. ERCOT is proposing 45 minutes to account for control room response, rapid changes in PRC, and delays in SOC telemetry changes. This NPRR does not impact requirements for ESRs and is only intended to change ERCOT’s PRC calculation. It is also worth noting this change is distinct from the Ancillary Service duration topic that is being considered by the Real-Time Co-optimization plus Batteries Task Force (RTCBTF). | |

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| Proposed Protocol Language Revision |

**6.5.7.5 Ancillary Services Capacity Monitor**

(1) ERCOT shall calculate the following every ten seconds and provide Real-Time summaries to ERCOT Operators and all Market Participants using ICCP, giving updates of calculations every ten seconds, and posting on the ERCOT website, giving updates of calculations every five minutes, which show the Real-Time total system amount of:

(a) RRS capacity from:

(i) Generation Resources;

(ii) Load Resources excluding CLRs;

(iii) CLRs; and

(iv) Resources capable of Fast Frequency Response (FFR);

(b) Ancillary Service Resource Responsibility for RRS from:

(i) Generation Resources;

(ii) Load Resources excluding CLRs;

(iii) CLRs; and

(iv) Resources capable of FFR;

(c) ECRS capacity from:

(i) Generation Resources;

(ii) Load Resources excluding CLRs;

(iii) CLRs; and

(iv) Quick Start Generation Resources (QSGRs);

(d) Ancillary Service Resource Responsibility for ECRS from:

(i) Generation Resources;

(ii) Load Resources excluding CLRs; and

(iii) CLRs; and

(iv) QSGRs;

(e) ECRS deployed to Generation and Load Resources;

(f) Non-Spin available from:

(i) On-Line Generation Resources with Energy Offer Curves;

(ii) Undeployed Load Resources;

(iii) Off-Line Generation Resources; and

(iv) Resources with Output Schedules;

(g) Ancillary Service Resource Responsibility for Non-Spin from:

(i) On-Line Generation Resources with Energy Offer Curves;

(ii) On-Line Generation Resources with Output Schedules;

(iii) Load Resources;

(iv) Off-Line Generation Resources excluding QSGRs; and

(v) QSGRs;

(h) Undeployed Reg-Up and Reg-Down;

(i) Ancillary Service Resource Responsibility for Reg-Up and Reg-Down;

(j) Deployed Reg-Up and Reg-Down;

(k) Available capacity:

(i) With Energy Offer Curves in the ERCOT System that can be used to increase Generation Resource Base Points in SCED;

(ii) With Energy Offer Curves in the ERCOT System that can be used to decrease Generation Resource Base Points in SCED;

(iii) Without Energy Offer Curves in the ERCOT System that can be used to increase Generation Resource Base Points in SCED;

(iv) Without Energy Offer Curves in the ERCOT System that can be used to decrease Generation Resource Base Points in SCED;

(v) With RTM Energy Bid curves from available CLRs in the ERCOT System that can be used to decrease Base Points (energy consumption) in SCED;

(vi) With RTM Energy Bid curves from available CLRs in the ERCOT System that can be used to increase Base Points (energy consumption) in SCED;

(vii) From Resources participating in SCED plus the Reg-Up, ECRS, and RRS from Load Resources and the Net Power Consumption minus the Low Power Consumption from Load Resources with a validated Real-Time RRS and ECRS Schedule;

(viii) From Resources included in item (vii) above plus reserves from Resources that could be made available to SCED in 30 minutes;

(ix) In the ERCOT System that can be used to increase Generation Resource Base Points in the next five minutes in SCED; and

(x) In the ERCOT System that can be used to decrease Generation Resource Base Points in the next five minutes in SCED;

(l) Aggregate telemetered HSL capacity for Resources with a telemetered Resource Status of EMR;

(m) Aggregate telemetered HSL capacity for Resources with a telemetered Resource Status of OUT;

(n) Aggregate net telemetered consumption for Resources with a telemetered Resource Status of OUTL; and

(o) The ERCOT-wide PRC calculated as follows:

**PRC1 = Min(Max((RDF\*(HSL-NFRC) – Actual Net Telemetered Output)i , 0.0) , 0.2\*RDF\*(HSL-NFRC)i),**

where the included On-Line Generation Resources do not include WGRs, nuclear Generation

Resources, or Generation Resources with an output less than or equal to 95% of telemetered LSL or

with a telemetered status of ONTEST, ONHOLD, STARTUP, or SHUTDOWN.

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***WGRs***

***online***

***All***

***WGR***

***online***

***i***

**PRC2 = Min(Max((RDFW\*HSL – Actual Net Telemetered Output)i , 0.0) , 0.2\*RDFW\*HSLi),**

where the included On-Line WGRs only include WGRs that are Primary Frequency Response-capable.

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**PRC3 = ((Synchronous condenser output)i as qualified by item (8) of Operating Guide Section 2.3.1.2, Additional Operational Details for Responsive Reserve and ERCOT Contingency Reserve Service Providers))**

**PRC4 = (Min(Max((Actual Net Telemetered Consumption – LPC), 0.0), ECRS and RRS Ancillary Service Resource Responsibility \* 1.5) from all Load Resources controlled by high-set under frequency relays carrying an ECRS and/or RRS Ancillary Service Resource Responsibility)i**

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***resources***

***load***

***online***

***All***

***resource***

***load***

***online***

***i***





***resources***

***load***

***online***

***All***

***resource***

***load***

***online***

***i***

**PRC5 = Min(Max((LRDF\_1\*Actual Net Telemetered Consumption – LPC)i, 0.0), (0.2 \* LRDF\_1 \* Actual Net Telemetered Consumption)) from all CLRs active in SCED and carrying Ancillary Service Resource Responsibility**

**PRC6 = Min(Max((LRDF\_2 \* Actual Net Telemetered Consumption – LPC)i, 0.0), (0.2 \* LRDF\_2 \* Actual Net Telemetered Consumption)) from all CLRs active in SCED and not carrying Ancillary Service Resource Responsibility**

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***resources***

***load***

***online***

***All***

***resource***

***load***

***online***

***i***

**PRC7 = (Capacity from Resources capable of providing FFR)i**

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***resources***

***FFR***

***online***

***All***

***resource***

***FFR***

***online***

***i***

**PRC8 = (If discharging or idle, Min(X% of HSL based on droop, HSL-ESR-Gen “injection”, the capacity that can be sustained for 45 minutes per the State of Charge), else Min(X% of (HSL – LSL(ESR “charging”) based on droop, the capacity that can be sustained for 45 minutes per the State of Charge – LSL(ESR “charging”)))**

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***ESR***

***online***

***All***

***ESR***

***online***

***i***

**Excludes ESR capacity used to provide FFR.**

**PRC = PRC1 + PRC2 + PRC3 + PRC4 + PRC5 + PRC6 + PRC7 + PRC8**

The above variables are defined as follows:

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| **Variable** | **Unit** | **Description** |
| PRC1 | MW | Generation On-Line greater than 0 MW |
| PRC2 | MW | WGRs On-Line greater than 0 MW |
| PRC3 | MW | Synchronous condenser output |
| PRC4 | MW | Capacity from Load Resources carrying ECRS Ancillary Service Resource Responsibility |
| PRC5 | MW | Capacity from CLRs active in SCED and carrying Ancillary Service Resource Responsibility |
| PRC6 | MW | Capacity from CLRs active in SCED and not carrying Ancillary Service Resource Responsibility |
| PRC7 | MW | Capacity from Resources capable of providing FFR |
| PRC8 | MW | ESR capacity capable of providing Primary Frequency Response |
| PRC | MW | Physical Responsive Capability |
| X | Percentage | Percent threshold based on the Governor droop setting of ESRs |
| RDF |  | The currently approved Reserve Discount Factor |
| RDFW |  | The currently approved Reserve Discount Factor for WGRs |
| LRDF\_1 |  | The currently approved Load Resource Reserve Discount Factor for CLRs carrying Ancillary Service Resource Responsibility |
| LRDF\_2 |  | The currently approved Load Resource Reserve Discount Factor for CLRs not carrying Ancillary Service Resource Responsibility |
| NFRC | MW | Non-Frequency Responsive Capacity |

(2) Each QSE shall operate Resources providing Ancillary Service capacity to meet its obligations. If a QSE experiences temporary conditions where its total obligation for providing Ancillary Service cannot be met on the QSE’s Resources, then the QSE may add additional capability from other Resources that it represents. It adds that capability by changing the Resource Status and updating the Ancillary Service Schedules and Ancillary Services Resource Responsibility of the affected Resources and notifying ERCOT under Section 6.4.9.1, Evaluation and Maintenance of Ancillary Service Capacity Sufficiency. If the QSE is unable to meet its total obligations to provide committed Ancillary Services capacity, the QSE shall notify ERCOT immediately of the expected duration of the QSE’s inability to meet its obligations. ERCOT shall determine whether replacement Ancillary Services will be procured to account for the QSE’s shortfall according to Section 6.4.9.1.

(3) The Load Resource Reserve Discount Factors (RDFs) for CLRs (LRDF\_1 and LRDF\_2) shall be subject to review and approval by TAC.

(4) The RDFs used in the PRC calculation shall be posted to the ERCOT website no later than three Business Days after approval.

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| ***[NPRR1010, NPRR1014, NPRR1029, NPRR1188, NPRR1204, and NPRR1244: Replace applicable portions of Section 6.5.7.5 above with the following upon system implementation for NPRR1014, NPRR1029, NPRR1188, or NPRR1224; or upon system implementation of the Real-Time Co-Optimization (RTC) project for NPRR1010 and NPRR1204:]***  **6.5.7.5 Ancillary Services Capacity Monitor**  (1) Every ten seconds, ERCOT shall calculate the following and provide Real-Time summaries to ERCOT Operators and all Market Participants using ICCP and postings on the ERCOT website showing the Real-Time total system amount of:  (a) RRS capability from:  (i) Generation Resources and ESRs in the form of PFR that can be sustained for the SCED duration requirements of PFR;  (ii) Load Resources, excluding CLRs, capable of responding via under-frequency relay;  (iii) CLRs in the form of PFR;  (iv) Resources, other than ESRs, capable of Fast Frequency Response (FFR); and  (v) ESRs, in the form of FFR, that can be sustained for the SCED duration requirements of FFR;  (b) Ancillary Service Resource awards for RRS to:  (i) Generation Resources and ESRs in the form of PFR;  (ii) Load Resources, excluding CLRs, capable of responding by under-frequency relay;  (iii) CLRs in the form of PFR; and  (iv) Resources providing FFR;  (c) ECRS capability from:  (i) Generation Resources;  (ii) Load Resources excluding CLRs;  (iii) CLRs;  (iv) Quick Start Generation Resources (QSGRs); and  (v) ESRs that can be sustained for the SCED duration requirements of ECRS.  (d) Ancillary Service Resource awards for ECRS to:  (i) Generation Resources;  (ii) Load Resources excluding CLRs; and  (iii) CLRs;  (iv) QSGRs; and  (v) ESRs.  (e) ECRS manually deployed by Resources with a Resource Status of ONSC;  (f) Non-Spin available from:  (i) On-Line Generation Resources with Energy Offer Curves;  (ii) Undeployed Load Resources;  (iii) Off-Line Generation Resources and On-Line Generation Resources with power augmentation;  (iv) Resources with Output Schedules; and  (v) ESRs that can be sustained for the SCED duration requirements of Non-Spin.  (g) Ancillary Service Resource awards for Non-Spin to:  (i) On-Line Generation Resources with Energy Offer Curves;  (ii) On-Line Generation Resources with Output Schedules;  (iii) Load Resources;  (iv) Off-Line Generation Resources excluding Quick Start Generation Resources (QSGRs), including Non-Spin awards on power augmentation capacity that is not active on On-Line Generation Resources;  (v) QSGRs; and  (vi) ESRs.  (h) Reg-Up and Reg-Down capability (for ESRs, the SCED duration requirements of Reg-Up and Reg-Down are considered);  (i) Undeployed Reg-Up and Reg-Down;  (j) Ancillary Service Resource awards for Reg-Up and Reg-Down;  (k) Deployed Reg-Up and Reg-Down;  (l) Available capacity:  (i) With Energy Offer Curves in the ERCOT System that can be used to increase Generation Resource Base Points in SCED;  (ii) With Energy Offer Curves in the ERCOT System that can be used to decrease Generation Resource Base Points in SCED;  (iii) Without Energy Offer Curves in the ERCOT System that can be used to increase Generation Resource Base Points in SCED;  (iv) Without Energy Offer Curves in the ERCOT System that can be used to decrease Generation Resource Base Points in SCED;  (v) With Energy Bid Curves from available CLRs in the ERCOT System that can be used to decrease Base Points (energy consumption) in SCED;  (vi) With Energy Bid Curves from available CLRs in the ERCOT System that can be used to increase Base Points (energy consumption) in SCED;  (vii) From Resources participating in SCED plus the Reg-Up, RRS, and ECRS from Load Resources and the Net Power Consumption minus the Low Power Consumption from Load Resources with a validated Real-Time RRS and ECRS awards;  (viii) With Energy Bid/Offer Curves for ESRs in the ERCOT System that can be used to increase ESR Base Points in SCED while respecting SCED duration requirements for ESR Base Points in SCED;  (ix) With Energy Bid/Offer Curves for ESRs in the ERCOT System that can be used to decrease ESR Base Points in SCED while respecting SCED duration requirements for ESR Base Points in SCED;  (x) Without Energy Bid/Offer Curves for ESRs in the ERCOT System that can be used to increase ESR Base Points in SCED while respecting SCED duration requirements for ESR Base Points in SCED;  (xi) Without Energy Bid/Offer Curves for ESRs in the ERCOT System that can be used to decrease ESR Base Points in SCED while respecting SCED duration requirements for ESR Base Points in SCED;  (xii) From Resources included in item (vii) above plus reserves from Resources that could be made available to SCED in 30 minutes;  (xiii) In the ERCOT System that can be used to increase Generation Resource Base Points in the next five minutes in SCED; and  (xiv) In the ERCOT System that can be used to decrease Generation Resource Base Points in the next five minutes in SCED;  (xv) The total capability of Resources available to provide the following combinations of Ancillary Services, based on the Resource telemetry from the QSE and capped by the limits of the Resource:  (A) Capacity to provide Reg-Up, RRS, or both, irrespective of whether it is capable of providing ECRS or Non-Spin;  (B) Capacity to provide Reg-Up, RRS, ECRS, or any combination, irrespective of whether it is capable of providing Non-Spin; and  (C) Capacity to provide Reg-Up, RRS, ECRS, or Non-Spin, in any combination;  (m) Aggregate telemetered HSL capacity for Resources with a telemetered Resource Status of EMR;  (n) Aggregate telemetered HSL capacity for Resources with a telemetered Resource Status of OUT;  (o) Aggregate net telemetered consumption for Resources with a telemetered Resource Status of OUTL; and  (p) The ERCOT-wide PRC calculated as follows:  **PRC1 = Min(Max((RDF\*FRCHL – FRCO)i , 0.0) , 0.2\*RDF\*FRCHLi),**  where the included On-Line Generation Resources do not include WGRs, nuclear Generation  Resources, or Generation Resources with an output less than or equal to 95% of telemetered LSL or  with a telemetered status of ONTEST, ONHOLD, STARTUP, or SHUTDOWN.      ***WGRs***  ***online***  ***All***  ***WGR***  ***online***  ***i***  **PRC2 = Min(Max((RDFW\*HSL – Actual Net Telemetered Output)i , 0.0) , 0.2\*RDFW\*HSLi),**  where the included On-Line WGRs only include WGRs that are Primary Frequency Response-capable.  **PRC3 = ((Synchronous condenser output)i as qualified by item (8) of Operating Guide Section 2.3.1.2, Additional Operational Details for Responsive Reserve and ERCOT Contingency Reserve Service Providers))**  **PRC4 = (Min(Max((Actual Net Telemetered Consumption – LPC), 0.0), ECRS and RRS Ancillary Service Resource award \* 1.5) from all Load Resources controlled by high-set under-frequency relays with an ECRS and/or RRS Ancillary Service Resource award)i**      ***resources***  ***load***  ***online***  ***All***  ***resource***  ***load***  ***online***  ***i***  **PRC5 = Min(Max((LRDF\_1\*Actual Net Telemetered Consumption – LPC)i, 0.0), (0.2 \* LRDF\_1 \* Actual Net Telemetered Consumption)) from all CLRs active in SCED and qualified for Regulation Service and/or RRS with an Ancillary Service Resource award**      ***resources***  ***load***  ***online***  ***All***  ***resource***  ***load***  ***online***  ***i***  **PRC6 = Min(Max((LRDF\_2 \* Actual Net Telemetered Consumption – LPC)i, 0.0), (0.2 \* LRDF\_2 \* Actual Net Telemetered Consumption)) from all CLRs active in SCED and qualified for Regulation Service and/or RRS without an Ancillary Service Resource award**      ***resources***  ***load***  ***online***  ***All***  ***resource***  ***load***  ***online***  ***i***  **PRC7 = (Capacity from Resources capable of providing FFR)i**      ***resources***  ***FFR***  ***online***  ***All***  ***resource***  ***FFR***  ***online***  ***i***  **PRC8 = (If discharging or idle, Min(X% of HSL based on droop, HSL-ESR-Gen “injection”, the capacity that can be sustained for 45 minutes per the State of Charge), else Min(X% of (HSL – LSL(ESR “charging”) based on droop, the capacity that can be sustained for 45 minutes per the State of Charge – LSL(ESR “charging”)))**      ***ESR***  ***online***  ***All***  ***ESR***  ***online***  ***i***  **Excludes ESR capacity used to provide FFR.**  **PRC9 = (If discharging or idle, Min(X% of HSL based on droop, HSL-Gen “injection”, the sum of the MW headroom available from the intermittent renewable generation component and the MW capacity that can be sustained for 45 minutes per the ESS State of Charge), else Min(X% of Real-Time Total Capacity based on droop, the sum of the MW headroom available from the intermittent renewable generation component and the MW capacity that can be sustained for 45 minutes per the ESS State of Charge))**      ***DC-Coupled Resources***  ***online***  ***All***  ***ESR***  ***online***  ***i***  **Excludes DC-Coupled Resource capacity used to provide FFR.**  **PRC = PRC1 + PRC2 + PRC3+ PRC4 + PRC5 + PRC6 + PRC7 + PRC8 + PRC9**  The above variables are defined as follows:   |  |  |  | | --- | --- | --- | | **Variable** | **Unit** | **Description** | | PRC1 | MW | Generation On-Line greater than 0 MW | | PRC2 | MW | WGRs On-Line greater than 0 MW | | PRC3 | MW | Synchronous condenser output | | PRC4 | MW | Capacity from Load Resources with an ECRS Ancillary Service Resource award | | PRC5 | MW | Capacity from CLRs active in SCED and qualified for Regulation Service and/or RRS with an Ancillary Service Resource award | | PRC6 | MW | Capacity from CLRs active in SCED and qualified for Regulation Service and/or RRS without an Ancillary Service Resource award | | PRC7 | MW | Capacity from Resources capable of providing FFR | | PRC8 | MW | ESR capacity capable of providing Primary Frequency Response | | PRC9 | MW | Capacity from DC-Coupled Resources capable of providing Primary Frequency Response | | PRC | MW | Physical Responsive Capability | | X | Percentage | Percent threshold based on the Governor droop setting of ESRs | | RDF |  | The currently approved Reserve Discount Factor | | RDFW |  | The currently approved Reserve Discount Factor for WGRs | | LRDF\_1 |  | The currently approved Load Resource Reserve Discount Factor for CLRs awarded an Ancillary Service Resource award | | LRDF\_2 |  | The currently approved Load Resource Reserve Discount Factor for CLRs not awarded an Ancillary Service Resource award | | FRCHL | MW | Telemetered High limit of the FRC for the Resource | | FRCO | MW | Telemetered output of FRC portion of the Resource |   (2) The Load Resource Reserve Discount Factors (RDFs) for CLRs (LRDF\_1 and LRDF\_2) shall be subject to review and approval by TAC.  (3) The RDFs used in the PRC calculation shall be posted to the ERCOT website no later than three Business Days after approval.  (4) ERCOT shall display on the ERCOT website and update every ten seconds a rolling view of the ERCOT-wide PRC, as defined in paragraph (1)(p) above, for the current Operating Day. |