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| Key Topic Concept (KTC) Number | 2 | KTC Title | Physical Responsive Capability, and ORDC Reserve |
| Date Posted | November 5, 2019 |
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| Executive Summary | This KTC recommends how Energy Storage Resources (ESRs) shall be treated in the calculation of Physical Responsive Capability (PRC) and Operating Reserve Demand Curve (ORDC) reserves. |
| Recommendation Description | PRC provided by ESRs should consider energy limitations of the Storage Resource as well as droop settings and potential higher PRC contribution when charging.RT On-Line Reserve Capacity (RTOLCAP) provided by ESRs should also consider energy limitations of the ESR besides potential higher RTOLCAP contributions when charging. |
| BESTF Discussion  | On 10/18/19, ERCOT staff presented material related to proposed contributions from ESRs to PRC, and ORDC Reserve.On 11/4/19, the BESTF reached consensus on KTC 2 items 1 and 2. |
| TAC Action Requested | BESTF plans to request at the 11/20/19 TAC meeting a vote to approve KTC 2. |
| TAC Action Summary |   |

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| Proposed KTC Recommendation Language |

# *Key Topic/Concept recommendation Language for TAC Approval*

11/20/19 TAC Meeting (Consensus from 11/4/19 BESTF meeting):

1. PRC provided by ESRs should also consider energy limitations of the Storage Resources besides droop settings and potential higher PRC contribution when charging. To consider energy limitations, a specific time period is required. This time period is currently recommended to be 15 minutes.

When online and sitting idle or discharging;

$$PRC=Min(X\% of HSL based on droop, HSL-"ESR-Gen"\left(injection\right),\frac{SOC\_{s}^{Telem}-SOC\_{s}^{OperMin}}{∆t}) $$

When Charging;

$$PRC=Min(X\% of \{HSL+"ESR-CLR" MW\}based on droop, "ESR-CLR" MW+\frac{SOC\_{s}^{Telem}-SOC\_{s}^{OperMin}}{∆t}) $$

$Where ∆t=\frac{1}{4} hour$

*ESR-Gen: Energy Storage Resource modeled as Generation Resource*

*ESR-CLR: Energy Storage Resource modeled as Controllable Load Resource (CLR)*

*SOC: State of Charge*

1. RTOLCAP provided by ESRs should also consider energy limitations of the Storage Resources besides potential higher RTOLCAP contribution when charging. To consider energy limitations, a specific time period is required. This time period is currently recommended to be 15 minutes.

When online and sitting idle or discharging;

$$RTOLCAP=Min(HSL-"ESR-Gen" Base Point,\frac{SOC\_{s}^{Telem}-SOC\_{s}^{OperMin}}{∆t}) $$

When Charging;

$$RTOLCAP=Min(HSL+"ESR-CLR" Base Point, "ESR-CLR" Base Point+\frac{SOC\_{s}^{Telem}-SOC\_{s}^{OperMin}}{∆t})$$

$Where ∆t=\frac{1}{4} hour$

*ESR-Gen: Energy Storage Resource modeled as Generation Resource*

*ESR-CLR: Energy Storage Resource modeled as Controllable Load Resource (CLR)*

*SOC: State of Charge*

# *Key Topic/Concept recommendation Language Previously approved by tac*

None.

# *Key Topic/Concept recommendation Language IN DISCUSSION AT BESTF*

None.

# *Future Decision Points and Issues for Developing Key topic/Concept recommendation Language*

None.

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| Applicable Protocol Section(s) |  |
| Impacted System(s) / Application(s) |  |