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## **RTC Design Recommendations**

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**Recommendation 1: Divide the ORDC curve in the order of RUS, RRS, ECRS, and NSRS.** RTC will forgo lower value services before sacrificing higher value services when needed by SCED – e.g. if there’s energy scarcity or ramping issue, RTC will first forgo Non-Spin, then ECRS, then RRS and/or RUS, the MWs from each limited by the resource’s ramp rate. Lower value AS – On-line NSRS and non-frequency responsive ECSR – that are not deployed by LFC are really there to provide scarcity price signals and thus should be sacrificed first before the critical AS (RUS and RRS) are sacrificed by RTC.

**Recommendation 2: Have only one NSRS product for both RTM and DAM (current ORDC values online capacity and offline capacity differently in RTM)**

**Recommendation 3: Allow higher value AS to meet lower value AS requirements if it’s offered at a lower price – this results in the curve being divided as depicted above: RUS, RRS, RUS+RRS+ECRS, and RUS+RRS+ECRS+NSRS.**

Concept of this ASDC is similar to today’s ORDC where Online Non-Spin demand curve overlaps with Off-line Non-Spin with Online NSRS able to satisfy the demand curve for both Online and Offline NSRS whereas Offline NSRS is considered a lower value product. The benefits of this approach are:

1. If a higher value service is offered at a lower price than the lower value, then RTC will procure that higher value service and have more of that higher value service. This will ensure that higher value reserves have a higher MCPC than a lower value service (i.e. greater efficiency) while providing the system with greater reliability.
2. All reserves now have true demand curves that are not artificially truncated. There’s always additional reliability value of having more of any one reserve (it’s ludicrous and against reliability and economic reasoning to say the system needs exactly 300MW of RUS or 2300MW of RRS and the next MW of these services is worthless). These ASDCs reflect that fact.

Let’s look at an example of only two AS products (RUS and ECRS) assuming rectangular ASDCs for each for simplicity at $9000/MW/hr for 1000MW and $2000/MW/hr for 2000MW.

## RTC optimization Objective

Maximize bid based costs (energy bids and AS Demand Curves) minus offer based revenue (energy offers and AS offers)

$$Min \sum\_{i=1}^{Ng}C(MW\_{i}^{Energy})+\sum\_{i=1}^{Ng}Cr(MW\_{i}^{RUS})+\sum\_{i=1}^{Ng}Ce(MW\_{i}^{ECRS})+Dr(MW\_{}^{RUSShort})+De(MW\_{}^{ECRSShort})$$

Where *Dr* = $9000/MW/hr and *De* = $2000/MW/hr (say).

## Power Balance Constraint (the usual)

## System-Wide Regulation Up Procurement Constraint

$$\sum\_{i=1}^{Ng}MW\_{i}^{RUS}+MW\_{}^{RUSShort}\geq 1000$$

## System-Wide RUS and ECRS Procurement Constraint

$$\sum\_{i=1}^{Ng}MW\_{i}^{RUS}+\sum\_{i=1}^{Ng}MW\_{i}^{ECRS}+MW\_{}^{RUSShort}+MW\_{}^{ECRSShort}\geq 3000$$

## Lagrangian:

$$ \sum\_{i=1}^{Ng}C(MW\_{i}^{Energy})+\sum\_{i=1}^{Ng}Cr(MW\_{i}^{RUS})+\sum\_{i=1}^{Ng}Ce(MW\_{i}^{ECRS})+Dr(MW\_{}^{RUSShort})+De(MW\_{}^{ECRSShort})$$

* λr [$\sum\_{i=1}^{Ng}MW\_{i}^{RUS}+MW\_{}^{RUSShort}-1000$] – λe [$\sum\_{i=1}^{Ng}MW\_{i}^{RUS}+\sum\_{i=1}^{Ng}MW\_{i}^{ECRS}+MW\_{}^{RUSShort}+MW\_{}^{ECRSShort}-3000$]

Then,

MCPC for ECRS = λe

MCPC for RUS = λr + λe

**Recommendation 4: Use the same ASDCs in DAM as in SCED. This will better reflect a willing buyer and lead to better price convergence between DAM and RTM.**

**Recommendation 5: Cap prices in RTM and DAM for energy (excluding congestion) and AS products at $9,000/MWh (instead of trying to ensure indifference which could result in artificially low prices).**

**Recommendation 6: Set the SWOC for DAM at $9,000/MWh (may require clarification from PUCT).** With RTM prices for energy and AS being able to reach $9,000/MWh, physical and financial players in DAM need to be able to reflect their willing to sell price in DAM.

**Recommendation 7: Provide credit to Load Resources for RRS or ECRS when deployed.**

Currently, ERCOT does not conduct a SASM every time LRs are deployed to re-procure RRS and the ORDC adder is paid to a hedged LR in the energy price and that portion of the energy price is taken back as AS Imbalance – LR providers always keeps the RRS capacity payment in DAM. Under ERCOT’s proposal, RTC to immediately re-procure RRS or ECRS after LR deployment which is likely to result in very high RRS or ECRS prices in RTM even though energy prices may be moderate (i.e. energy prices no longer add the AS price and may actually be much lower than the AS price). Then the LR provider is exposed to having to pay much higher prices in RTM than they were paid in DAM for the AS. Although LR isn’t deployed often, only one such occurrence will expose the risk to the LR provider and potentially result in them deciding the risk is too great to provide this service. Providing credit to LR when deployed and not re-procuring RRS or ECRS while the LR is deployed is current with how ERCOT currently does not re-procure RRS. The last ERCOT proposal did provide credit to LR deployed by XML but did not provide such credit to LR deployed by UFR – this recommendation is to provide credit for both deployments (similar to ERCOT’s proposal on Off-line NSRS deployment).

**Recommendation 8: Provide credit to Off-line NSRS provider when deployed until earlier of Resource telemeters ON status or 25 minutes.**

Last ERCOT proposal does provide credit for Off-line NSRS for the full capacity amount till the Resource starts producing energy – at which point ERCOT only provides partial credit. The resource is exposed to higher NSRS prices during the period of partial credit. This recommendation would eliminate that exposure and treat energy produced to energy deployed by LFC for RUS (when RUS energy is deployed by LFC, RUS provider still keeps the full RTC RUS capacity payment – the energy payment is on top of the capacity payment for the same capacity). ERCOT’s last proposal (instead of immediate re-procurement of the full capacity and this Resource not being able to provide either Off-line NSRS or On-line NSRS since its in startup mode) goes a long way in mitigating this exposure – so, my concern is not that great for this issue assuming ERCOT does not change their last proposal.

**Recommendation 9: Let Energy Storage Systems (ESS) AS deployment by LFC expire with each RTC run.**

ESS when provide RRS or ECRS and deployed by LFC must keep providing the service (say by producing energy at full capacity) till ERCOT issues a recall instruction under current design. However, for RTC purposes, that EES must be able to offer and be awarded RRS or ECRS for all SCED runs during the deployment and RTC must be able to keep awarding RRS or ECRS to the EES for that entire duration if that is the most economic RTC result. Otherwise, EES provider is exposed to the risk of having to buy back the AS capacity at a higher price in RTM than DAM for all those intervals. One way to accomplish this is for LFC deployments for each SCED interval under RTC to expire with the next SCED run – LFC would have to redeploy the ESS anew for each SCED interval only if the ESS is again awarded the AS for that SCED interval.