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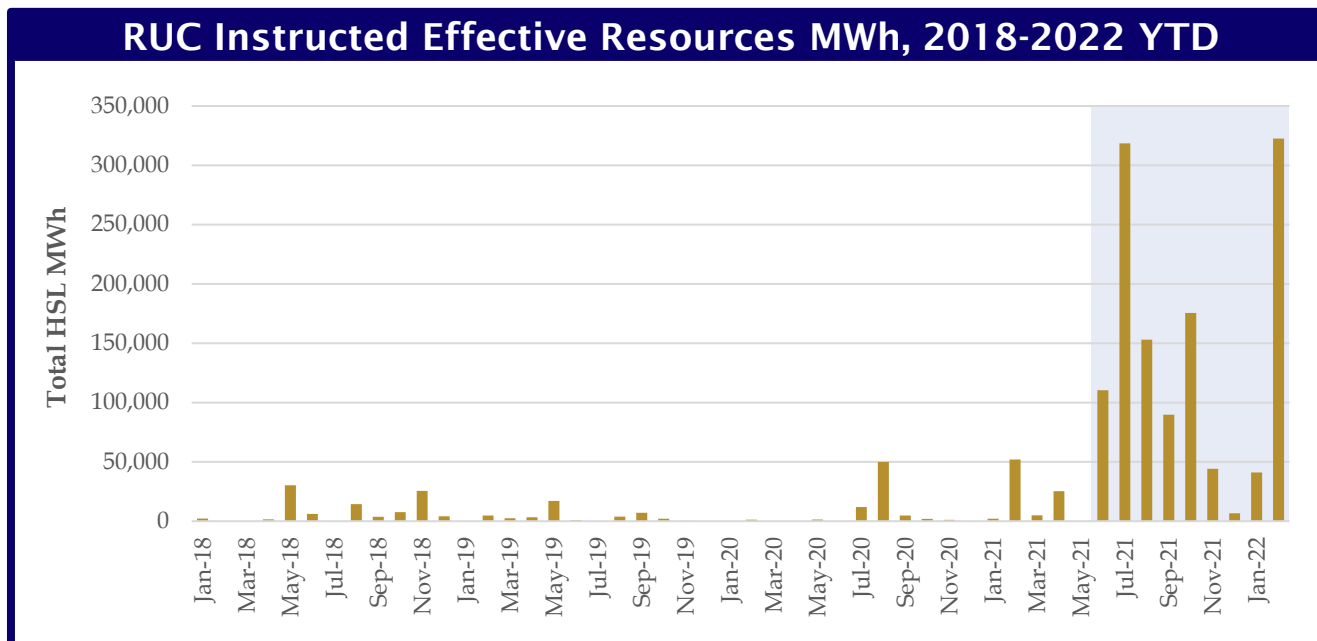
Analyzing consequences of reduction in the RUC Offer Floor on real-time energy prices (NPRR 1092)

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LEI was asked by Vistra Corp. to examine the implications of NPPR 1092 on real-time energy price

- ▶ ERCOT has authority to initiate Reliability Unit Commitment (“RUC”) and bring online resource capacity that did not otherwise self-commit in order to ensure capacity sufficiency on a system-wide or localized basis (e.g., cure local insufficiency due to transmission constraints)
- ▶ ERCOT’s RUC instructions have increased as seen in graph below - 96% of RUC commitments in 2021 based on effective resource-hours were instructed to maintain additional online reserves (not for resolving local issues)

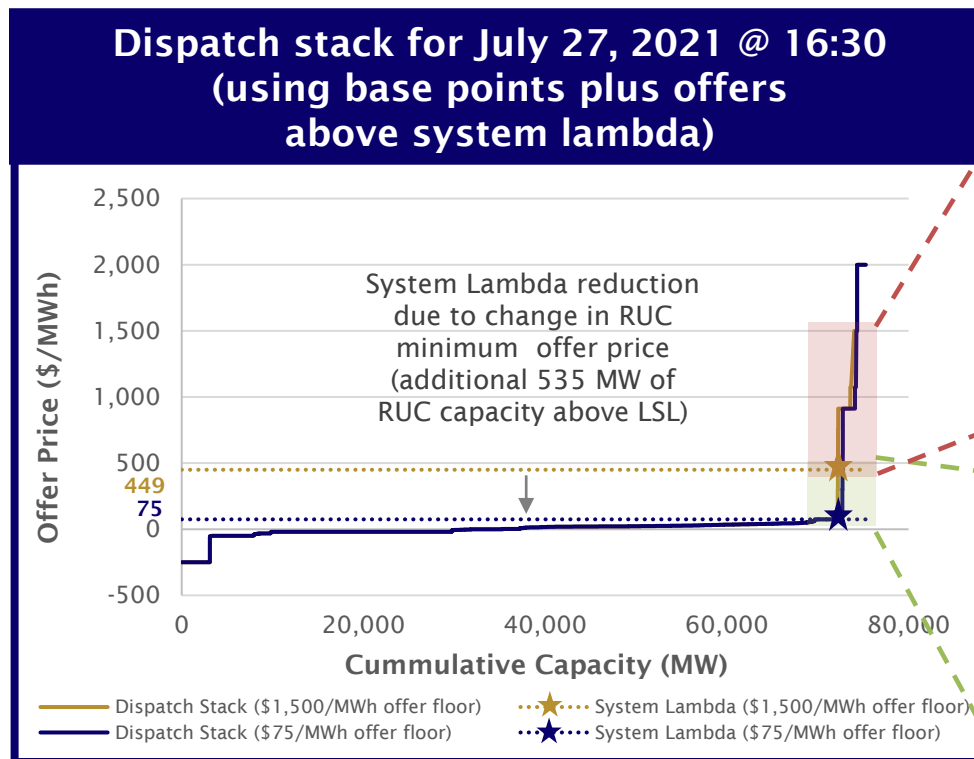


Source: ERCOT

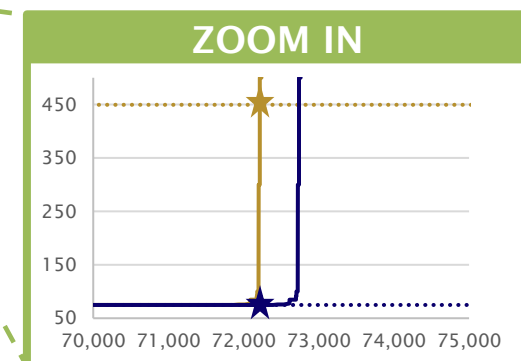
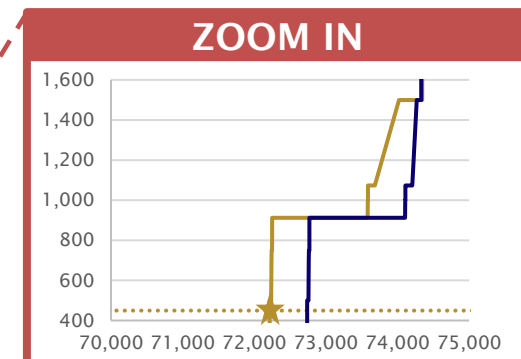
- ▶ Given ERCOT’s increased reliance on RUC, in conjunction with other market developments (e.g., ERCOT’s increased purchase of non-spin reserves and PUCT-approved ORDC changes), understanding RUC impacts is more important than it has ever been

NPRR 1092 proposes to move the minimum offer floor for RUCs from \$1,500/MWh to \$75/MWh

- ▶ System lambda prices in the second half of 2021 were above \$75/MWh in over 200 hours, or about 5% of the time (a significant amount, particularly in an energy-only market)
- ▶ A lower RUC offer floor would move the RUC capacity offers down the dispatch stack
- ▶ With the change in dispatch stack position, more “out of market” RUC capacity would be dispatched, displacing other economic offers and leading to a lower clearing price

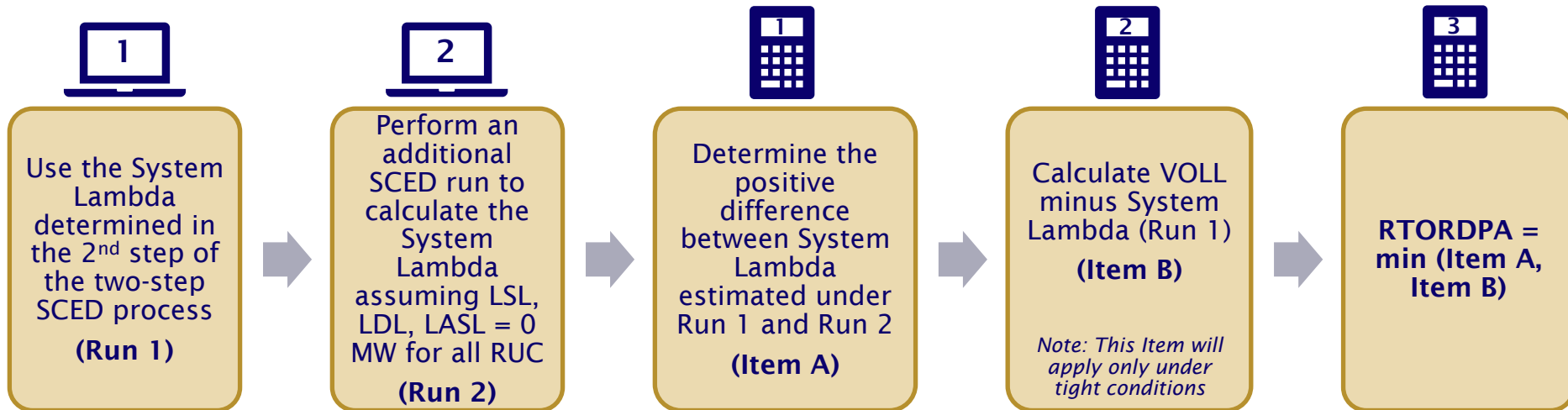


Source: LEI used ERCOT 60-day SCED data to recreate dispatch stack



If lower RUC offer floor causes an increase in the volume of energy produced from RUC resources, real-time reliability deployment price adder will be negatively affected

- ▶ Real-time online reliability deployment price adder (“RTORDPA”) methodology may not always work with an offer floor that increases the dispatch profile of RUC resources



- ▶ Dispatch matters for the calculation of the ORDC adders because additional dispatch of RUC resources will displace dispatch of other economic offers

- If the displaced capacity remains as online reserves, there is no effect on RTORPA
- If the displaced capacity shifts from online to offline reserves, that will change the relative relationship between the RTORPA and RTOFFPA

$$RTORPA = v * 0.5 * \pi_S(RTOLCAP) + v * (1 - 0.5) * \pi_{NS}(RTOLCAP + RTOFFCAP)$$

where $v = \max(0, VOLL - \text{System Lambda})$

If an offer block of a running resource is partially-displaced by RUC, then that offer block converts to **online reserves (RTOLCAP)**

Certain resources that are fully-displaced by RUC, may go to OFF or OFFNS status, then that capacity converts to **offline reserves (RTOFFCAP)**

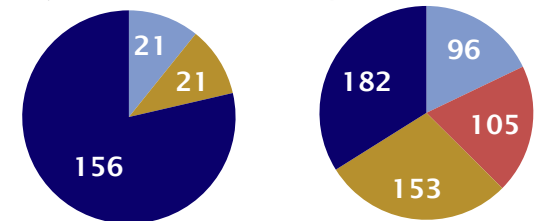
Reducing RUC energy offer floor would cause System Lambda to decline – sometimes by hundreds of dollars

- ▶ For this illustrative analysis, LEI selected 15-minute intervals on two days in July 2021 during which ERCOT instructed RUC
 - These days were also characterized by high demand (top 2% for the year), low wind conditions (a fraction of the typical average of 11 GW), system lambdas greater than \$75/MWh and relatively high price adders
- ▶ LEI re-estimated the system lambda with a lower RUC offer price (\$75/MWh) using the base points from the 60-day SCED reports
 - Resources' base points were taken as “given”, thereby all system constraints were assumed to not change
- ▶ On July 27, 2021 at 16:30, an additional 535 MW of dispatched RUC capacity would decrease System Lambda by over \$370/MWh, while on July 24, 2021 at 17:15 the system lambda would fall by about \$12/MWh (due to additional dispatch of 199 MW of RUC)
 - Displaced capacity includes both partially displaced units and fully-displaced quick start units
 - In both cases, the re-estimated system lambda would be \$75/MWh – however, the outcome for other intervals will depend on relative size of RUC fleet versus the resources being displaced vis-à-vis demand

Date	RUC minimum energy offer floor (\$/MWh)	System Lambda (\$/MWh)	Total Base Points (MW)	RUC up to LSL (MW)	RUC above LSL (MW)	Spare RUC capacity (MW)	Total RUC capacity (MW)
July 24, 2021 @ 17:15	1,500.00	86.67	69,269	201	0	639	840
	75.00	75.00	69,269	201	199	440	840
		-11.67	=	=	+199	-199	=
July 27, 2021 @ 16:30	1,500.00	449.40	72,217	141	0	659	800
	75.00	75.00	72,217	141	535	124	800
		-374.40	=	=	+535	-535	=

Displaced capacity by technology (MW)

July 24, 2021 @ 17:15 July 27, 2021 @ 16:30

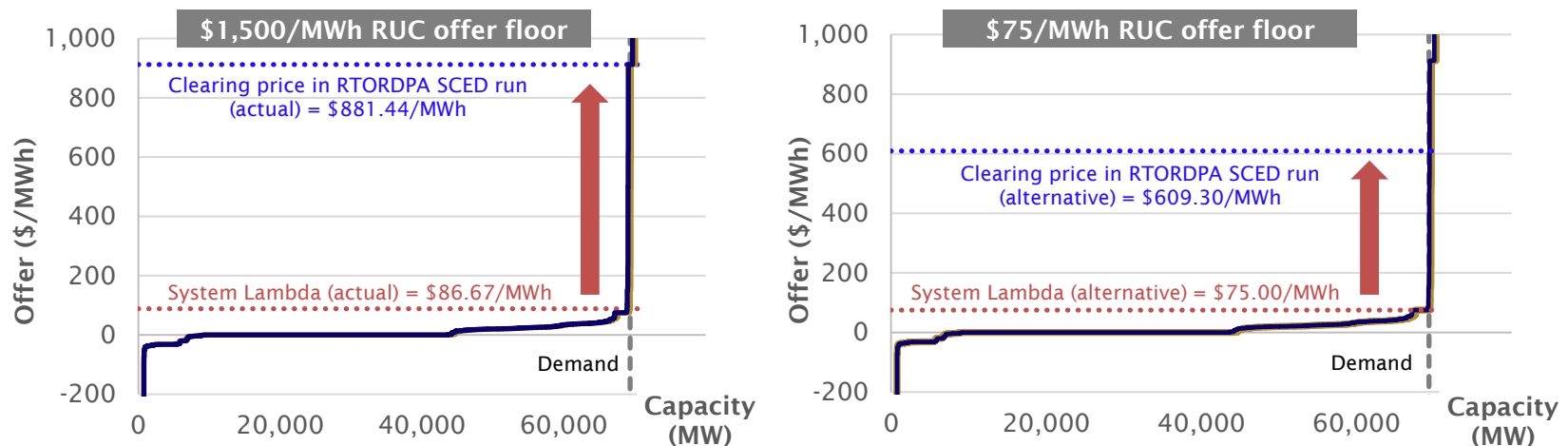


■ Combined Cycle
■ Diesel
■ Gas Steam
■ Simple Cycle

RTORDPA mechanism would not be able to fully offset the decline in system lambda under some conditions

- ▶ LEI re-created the RTORDPA calculation process using its backcasting tools
- ▶ Depending on the shape of the energy offer curve, RTORDPA under the \$75/MWh offer floor alternative may not capture the full impact of dispatched RUC on system lambda
 - For July 24, 2021 at 17:15, RTORDPA would fall from \$795 /MWh to \$534/MWh
 - For July 27, 2021 at 16:30, RTORDPA would not increase sufficiently to make up for the drop in system lambda

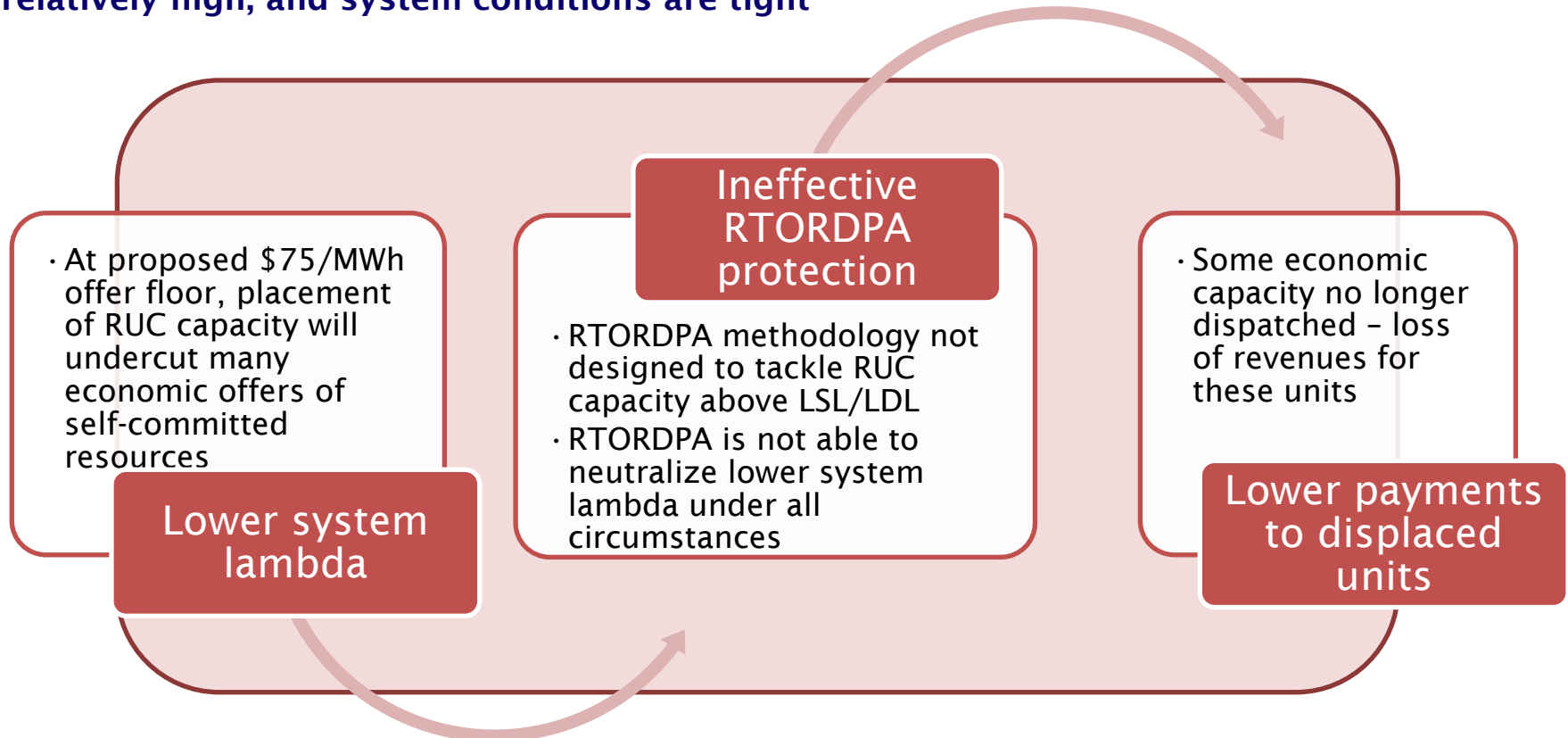
RT and RTORDPA SCED curves for July 24, 2021 @ 17:15



- ▶ This analysis highlights the inherent flaw in the current RTORDPA SCED run logic:
 - RTORDPA should be increasing (rather than decreasing) if the RUC capacity is causing system lambda to fall
 - Problem arises when RUC capacity is running above LSL and the LDL is smaller than Base Point
- ▶ ERCOT can fix the price signal issue by setting the RUC dispatched capacity in the RTORDPA SCED run to zero, which will yield appropriate system lambda correction factor
 - But this still harms RUC capacity, which is not earning any economic profit due to clawback

Lower energy market prices would *weaken* the economic incentive for self-commitment and investment

- Suppression of real time energy prices due to RUCs is most likely to occur when load is relatively high, and system conditions are tight



- Expectation of lower real time energy prices due to out-of-market action of ERCOT in combination with revised Protocols will lead to lower forward prices – likely delaying and deferring investment