RUC for Congestion on 9/21/2021 Follow-up

Congestion Management Working Group

Market Analysis & Validation

11/15/2021

Background

- On September 21, ERCOT committed nine Resources in the Houston, DFW and San Antonio areas.

- Unsolved contingencies were observed in the Operations Gap Study in the Houston area due to insufficient reactive support. There were also restricted flows on the West Texas GTC due to planned 345kV transmission outages.

- ERCOT Operator RUC'd generation in Houston for reactive support and in DFW and San Antonio to offset generation restricted by West Texas GTC.

RUC Commitments for 9/21/2021

Resource	HRUC Commitment Time	Committed Block	Operator Reason
(1)	9/21/2021 8:03 AM	HE13-18	N_TO_H Constraint
(2)	9/21/2021 8:03 AM	HE15-19	N_TO_H Constraint
(3)	9/21/2021 8:03 AM	HE13-19	N_TO_H Constraint
(4)	9/21/2021 9:03 AM	HE16-21	WESTEX Constraint
(5)	9/21/2021 9:03 AM	HE16-21	WESTEX Constraint
(6)	9/21/2021 9:03 AM	HE16-18	WESTEX Constraint
(7)	9/21/2021 9:03 AM	HE15-22	WESTEX Constraint
(8)	9/21/2021 9:03 AM	HE15-22	WESTEX Constraint
(9)	9/21/2021 10:03 AM	HE14-19	WESTEX Constraint

- 9 unique Resources were committed by operators on OD 9/21/2021. Among **those 9 Resources, 6 of them did optout in real-time.**
- 59 unique Resource were recommended for commitment at least one hour block by the HRUC engine for the 0800, 0900 and 1000 cases on 9/21/2021.
- ERCOT ran offline study for those HRUC cases for impact analysis by using methodology described on the next page.

Recap the Methodology used for HRUC offline study

Goal: Determine how committing Resources impacted congestion.

For each HRUC case, alter the case by making the committed Resources unavailable for HRUC commitment.

Compare the binding or violated constraints from the altered case with the original case.

- Specifically, look at the violated MWs and shadow prices on constraints.

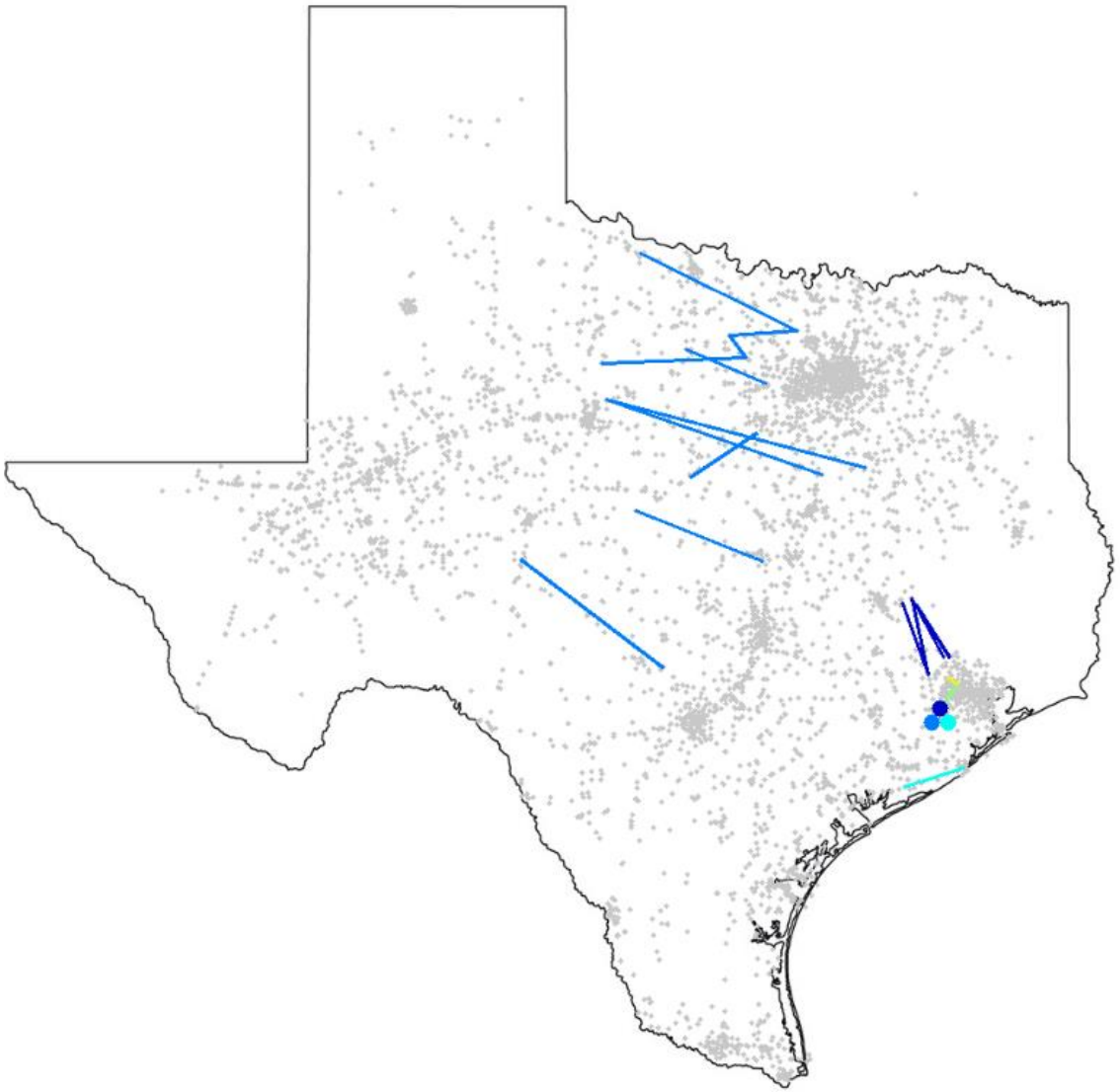
Please note that HRUC is one tool of many that operators use to determine when to commit a Resource. The scope of the offline study is just to show what the clearing engine saw when HRUC executed.

Analysis of HRUC Case 9/21/21 08:00

				(1)	(2)	(3)
Constraint	**Binding/Violated**	**Delta in MW Violation**	**Delta in Shadow Price**	**Shift Factor x RUC HSL**	**Shift Factor x RUC HSL**	**Shift Factor x RUC HSL**
BASECASE: N_TO_H	Binding	0 MW	$8,998/MWh	-65.23 MW	-59.93 MW	-93.57 MW
BASECASE: WESTEX	Binding	0 MW	$224/MWh	-14.55 MW	-13.37 MW	-20.83 MW
DWAPHLJ5: JCKSTP18_A	Binding	0 MW	$32,328/MWh	-14.1 MW	-12.96 MW	-19.62 MW
DTHWADK8: WO_WT_73_A	Violated	21.9 MW	$100,000/MWh	-6.4 MW	-5.88 MW	-9.16 MW
DWAP_BI5: WO_AT3H	Violated	31.7 MW	$100,000/MWh	-11.04 MW	-10.14 MW	-15.8 MW

Note:
1. Binding or Violated in any of the RUC hour blocks.
2. Delta represents altered case minus original case.
3. Largest delta out of all hour blocks is used.
4. Shift factor x RUC HSL is from HE17.

Analysis of HRUC Case 9/21/21 08:00



Analysis of HRUC Cases 9/21/21 09:00

				(4)	(5)	(6)	(7)	(8)
Constraint	Binding/ Violated	Delta in MW Violation	Delta in Shadow Price	Shift Factor x RUC HSL	Shift Factor x RUC HSL	Shift Factor x RUC HSL	Shift Factor x RUC HSL	Shift Factor x RUC HSL
BASECASE: WESTEX	Binding	0 MW	$828/MWh	-16.3 MW	-17.2 MW	-40.1 MW	-12.4 MW	-12.4 MW

Note:

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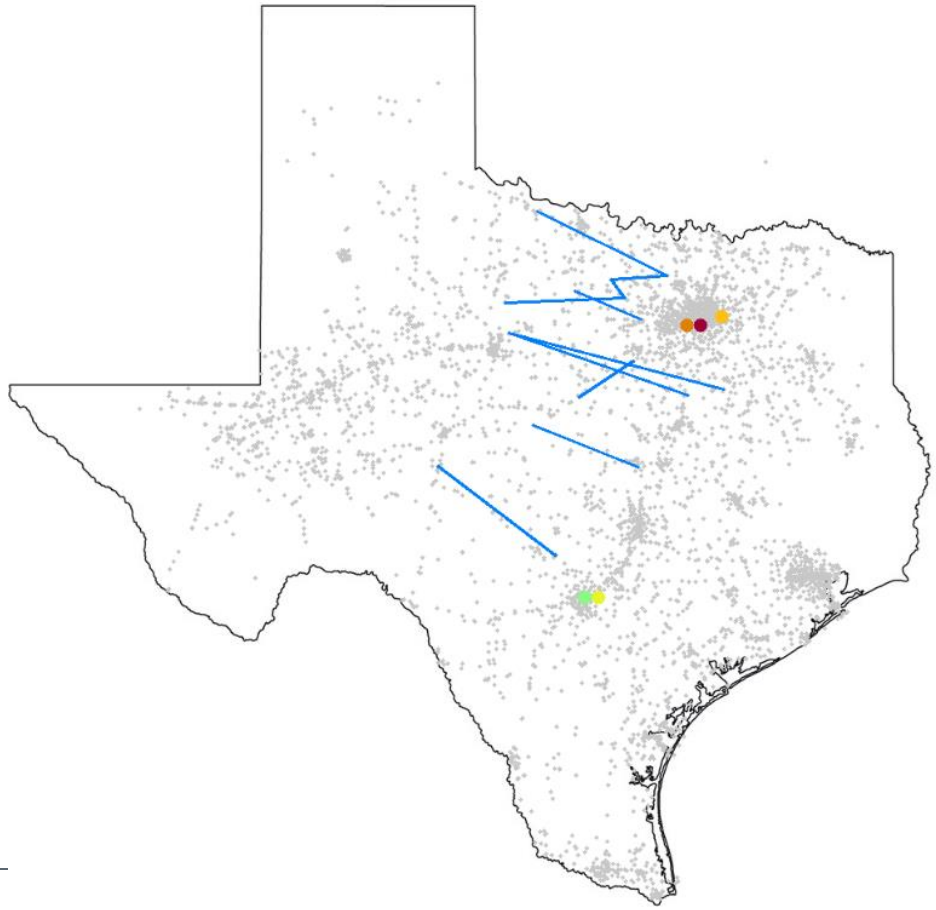

Analysis of HRUC Cases 9/21/21 10:00

(9)

Constraint	Binding/ Violated	Delta in MW Violation	Delta in Shadow Price	Shift Factor x RUC HSL
BASECASE: WESTEX	Binding	0 MW	$0/MWh	-27.11 MW

Note:
1. Binding or Violated in any of the RUC hour blocks.

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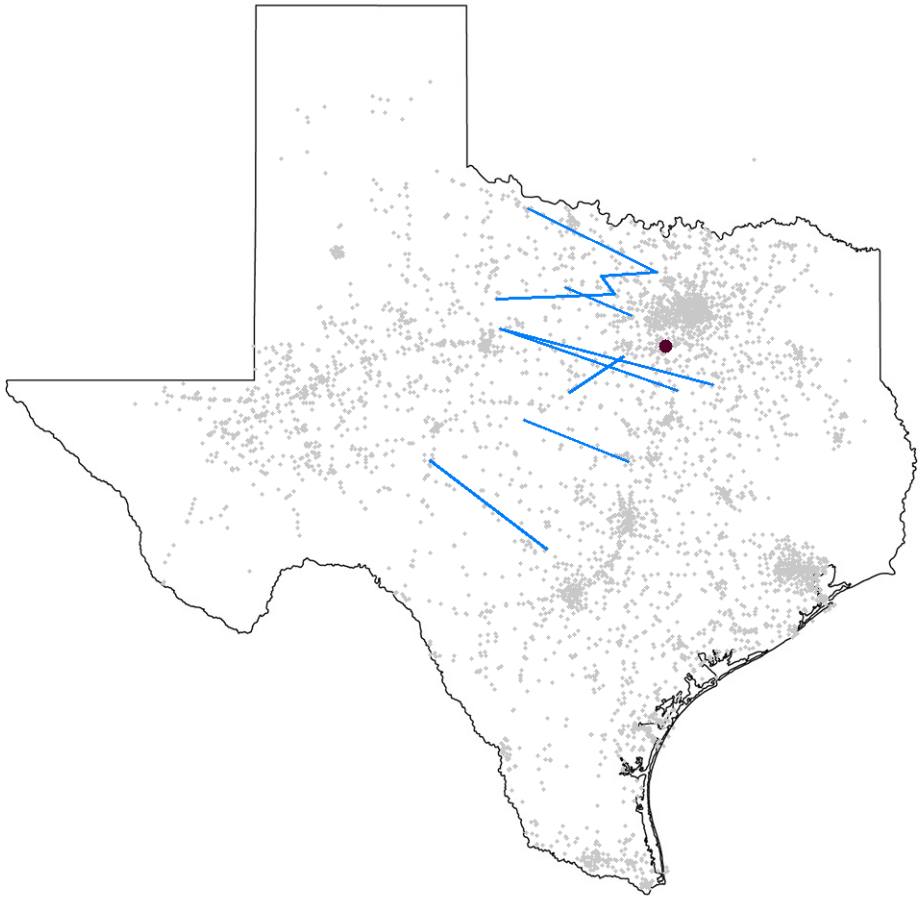


Follow-up questions to be addressed

- Can you supply more information for commitment related to WESTEX constraints?
- If RUC'd Resources were removed, what was the impact to SCED?
- What was the forecast used by HRUC and how was it compared to actual load?

Following slides will address those questions.

Summary of Operational Observation leading to RUC

For the 0800 HRUC Commitments

- Unsolved contingency DWAPHLJ5 is being seen due to a lack of committed Houston generation which results in low voltage or insufficient reactive support in the Houston area following the double-circuit loss. Commitment of Houston Area Generation is recommended.

For the 0900 & 1000 HRUC Commitments

- Operator sees risk of West Texas GTC limitations due to planned 345kV transmission line outages. Studies indicate that loss of any additional 345kV lines in area shows voltages dropping significantly resulting in reductions of WESTEX stability limits.

SCED impact of RUC'd Resources

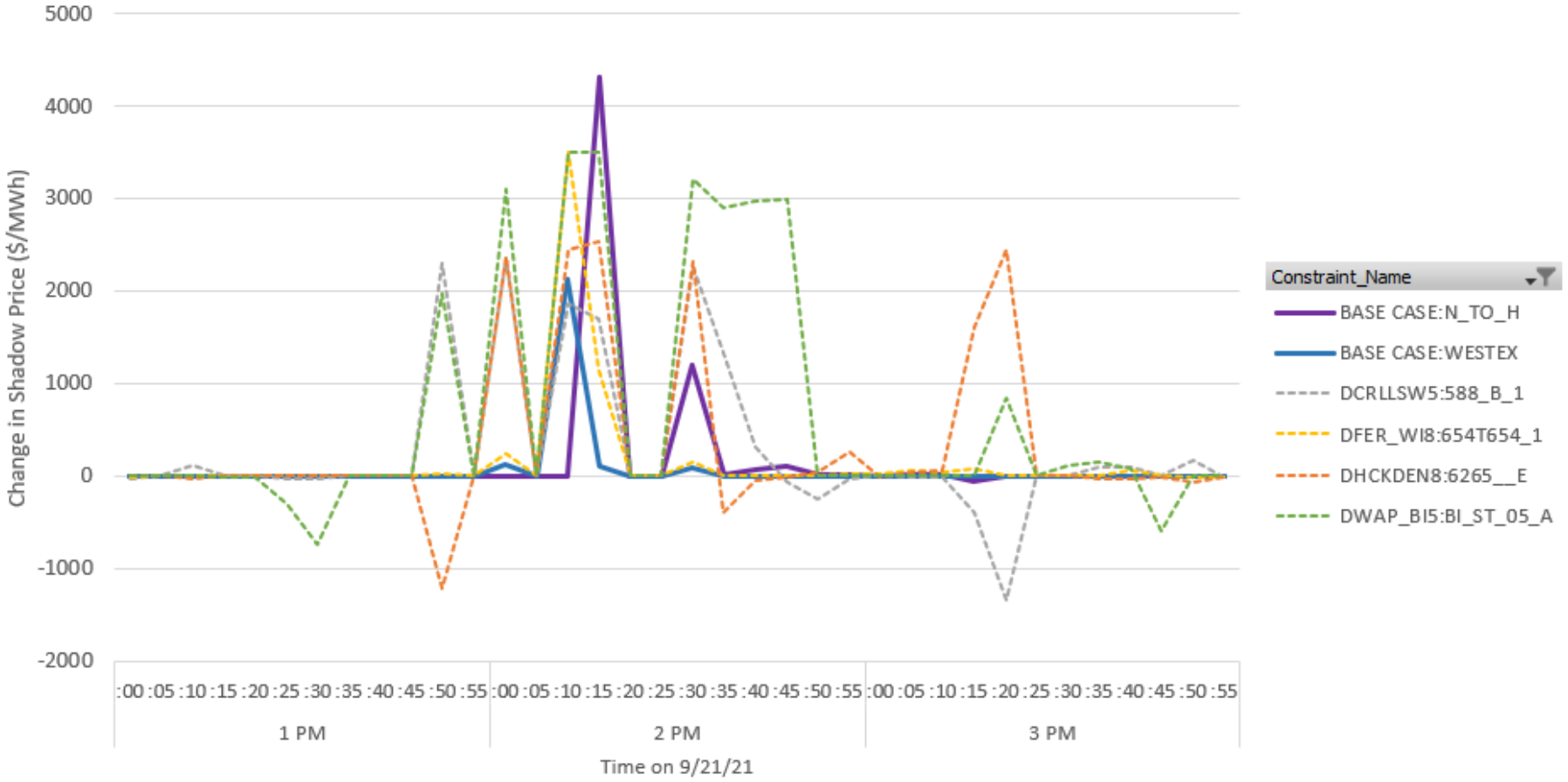
Methodology:

- Rerun SCED sequentially - Each SCED uses the output (base points, limits) from previous SCED rerun result as its input.
- Remove all 9 RUC'd Resources in the sequential rerun.
- Study Period is from 12:00 until 22:00 (HE13 ~ HE23).
- Please note that the result of this sequential run is NOT the same as reliability pricing run that is used in RDPA calculation.

Limitation:

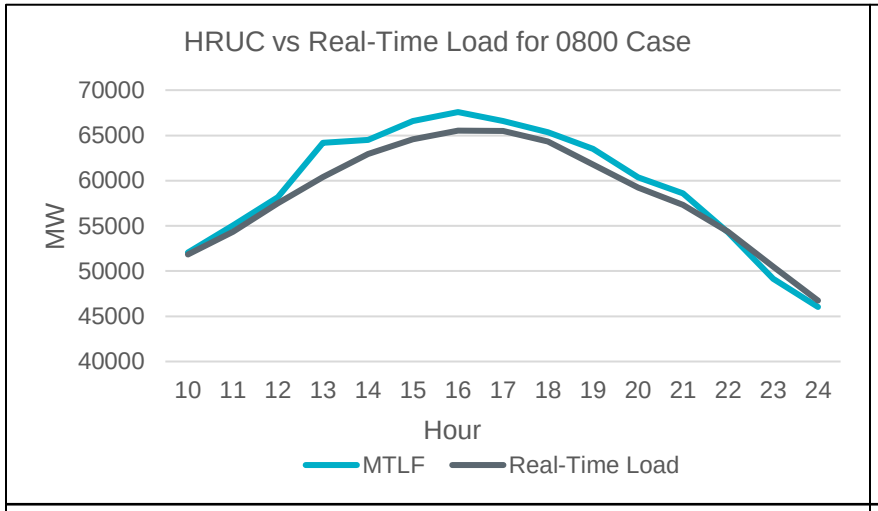
- The simulation models all Resources as perfectly following dispatch instructions. Additionally, behavioral factors cannot be simulated.

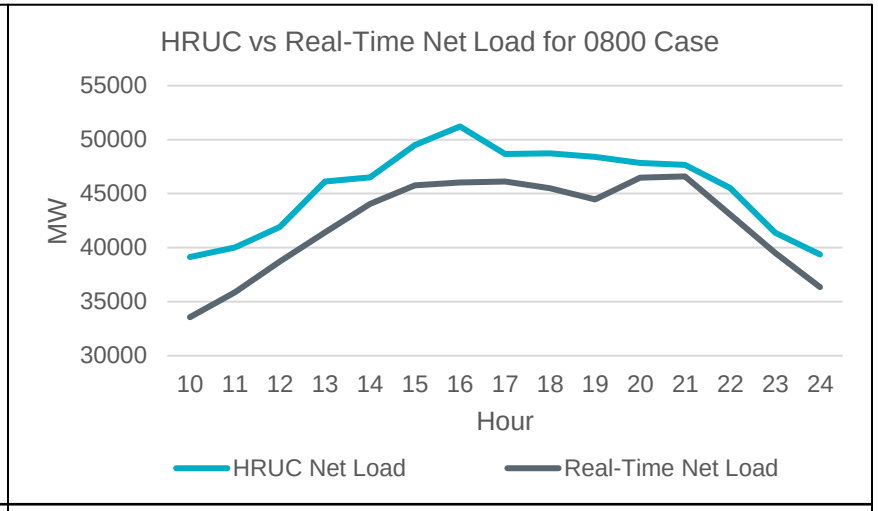
Rerun Difference – Constraint Shadow Price

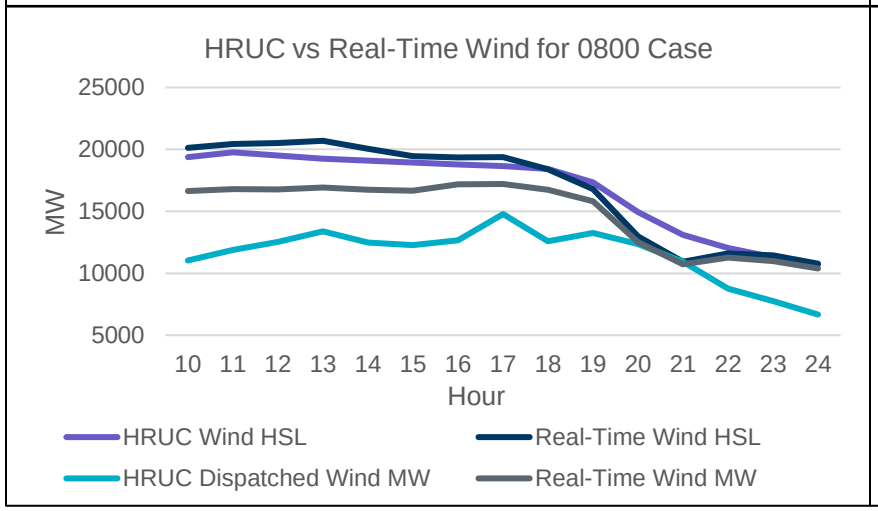


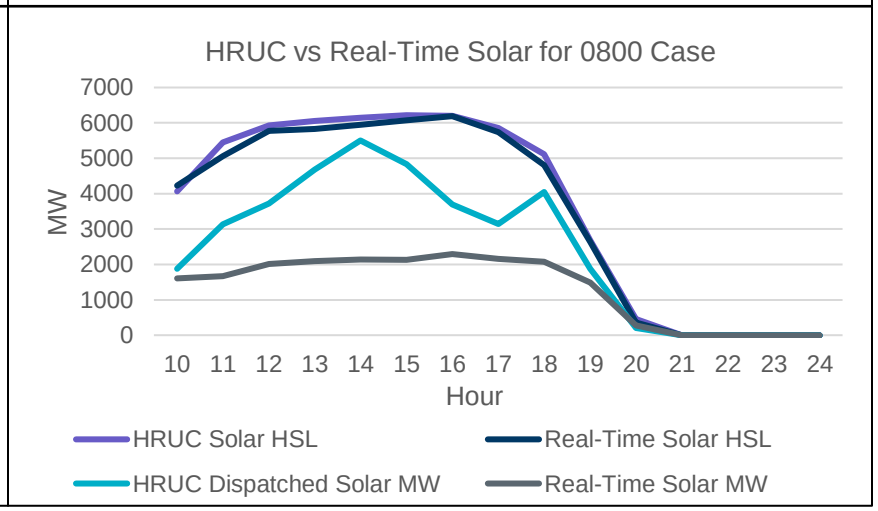
- The difference in Shadow Price is calculated as (Rerun Shadow Price – Original Shadow Price);
- The result shows that the RUC'd units helped the congestion to some extent.

Forecast Information for 08:00 HRUC



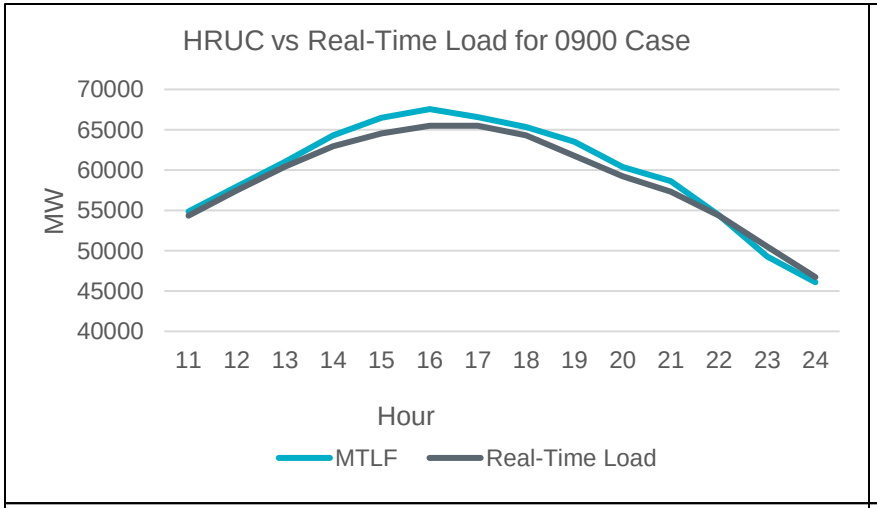


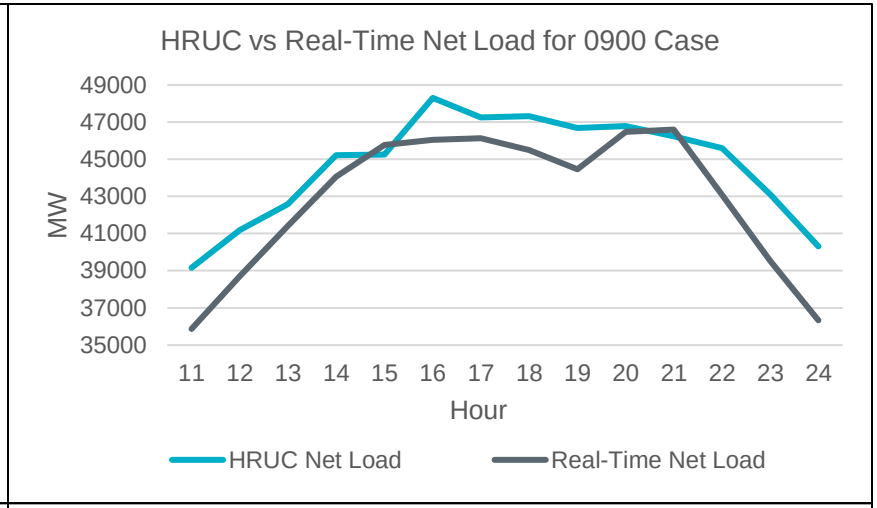


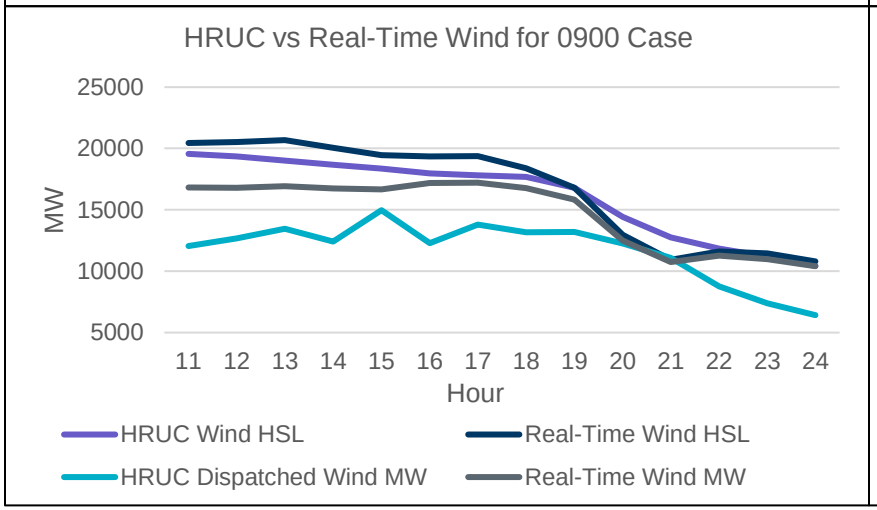


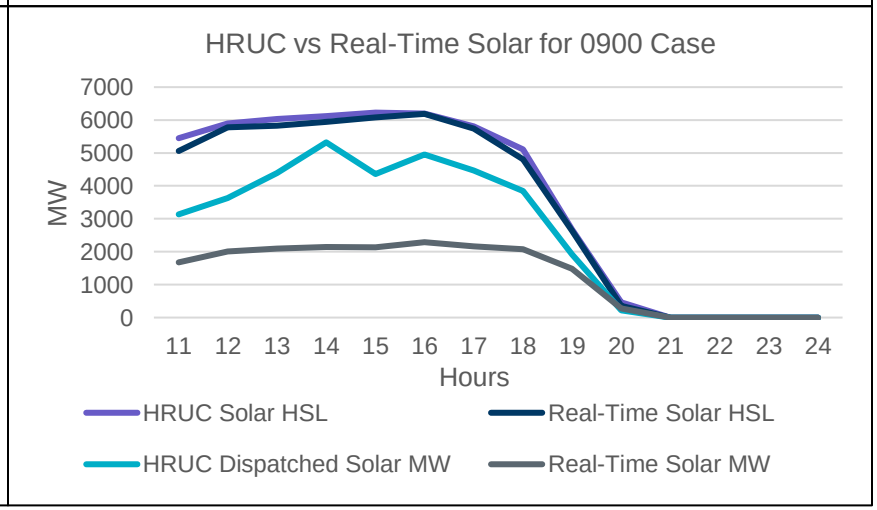
- MTLF : Mid-Term Load Forecast
- The “Real-Time Wind MW” and “Real-Time Solar MW” in the graphs are the hourly averaged telemetered MW values in real time.
- Real-Time Net Load = Real-Time Load – Real-Time Wind MW – Real-Time Solar MW
- HRUC Net Load = MTLF – HRUC dispatched Wind MW – HRUC dispatched Solar MW

Forecast Information for 09:00 HRUC









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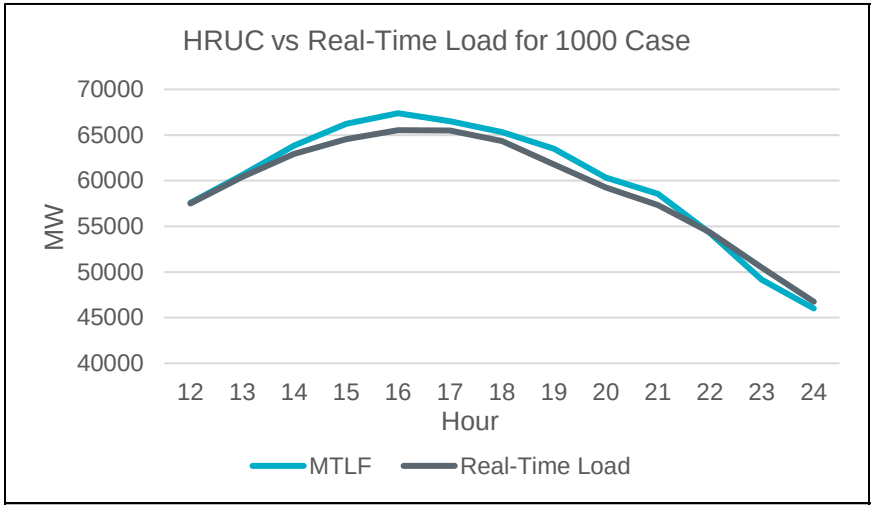
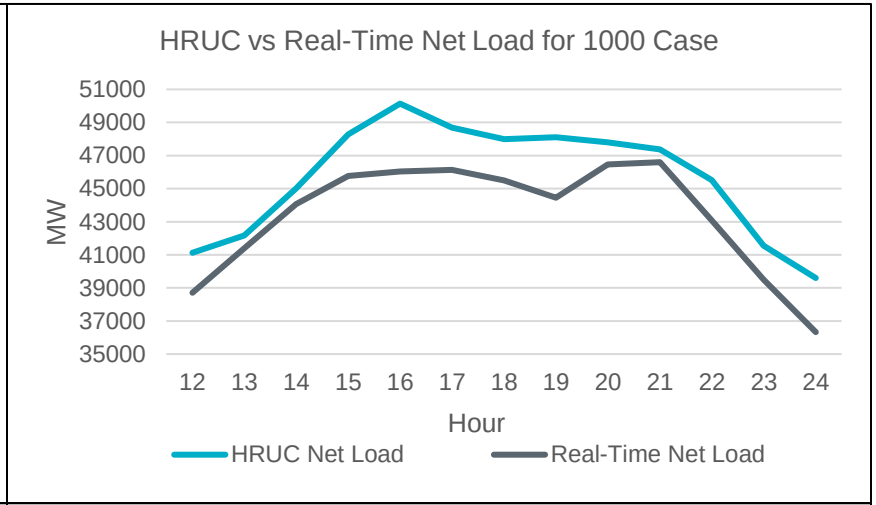
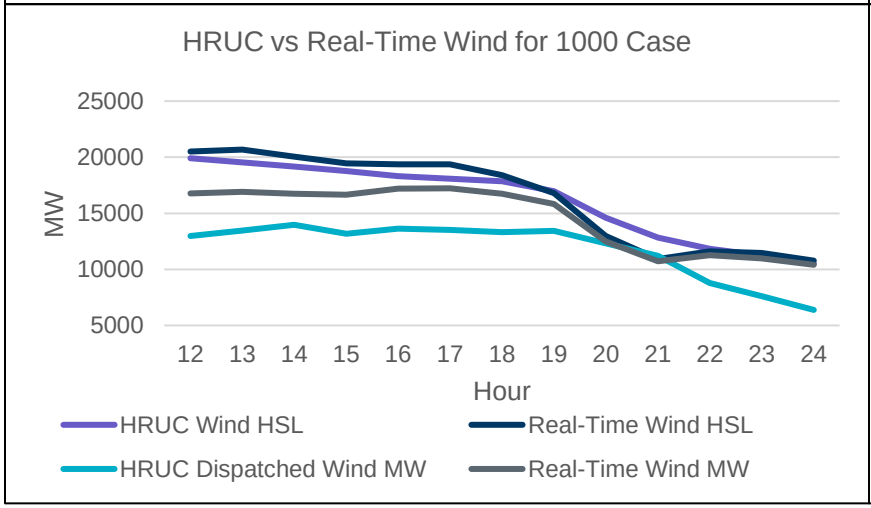
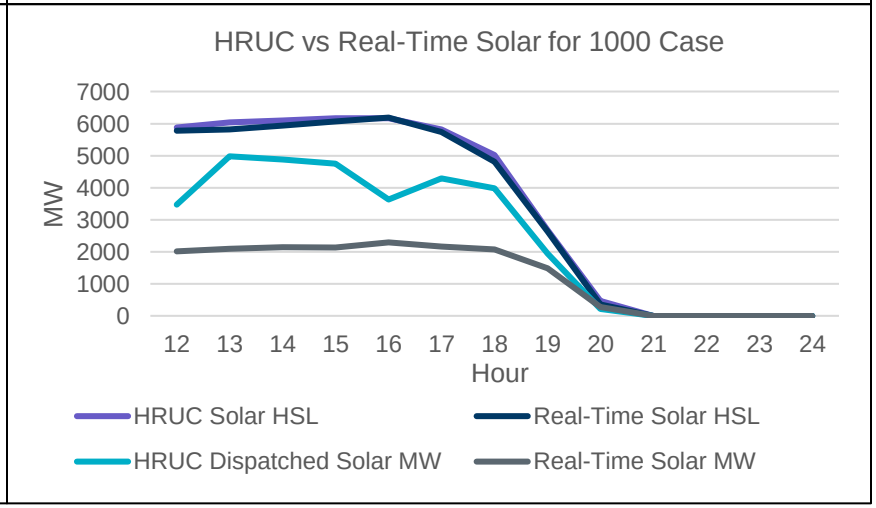
Forecast Information for 10:00 HRUC









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