Topics in this module ...

- Reliability Unit Commitment (RUC) Overview
- Formation of Resource Constraints in RUC
- The Mind of RUC
- QSE Responsibilities post-RUC
Reliability Unit Commitment
Overview
It ensures:

• Enough capacity is committed to serve the forecasted load

• Committed capacity is in the right locations
Ancillary Service Considerations

- RUC ensures enough “dispatchable” capacity to manage reliability
- Capacity reserved for Ancillary Services are unavailable to RUC

If preservation of a reserved Ancillary Service is infeasible, Ancillary Service is deemed “Undeliverable”
The Reliability Unit Commitment Process

- Current Operating Plans
- Network Operations Model
- Contingencies
- Load Forecast

Transmission Security Analysis (TSA)

Reliability Unit Commitment (RUC)

- Resource Commitments
- Resource Decommitments
- Undeliverable Ancillary Service
The Reliability Unit Commitment Process

- Current Operating Plans
- Network Operations Model
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Offers

Transmission Security Analysis (TSA)

Reliability Unit Commitment (RUC)

- Resource Commitments
- Resource Decommitments
- Undeliverable Ancillary Service
COP statuses through the eyes of RUC

- **ON** (any variety): Resource capacity is committed
- **OFF**: Resource is offline but available for RUC commitment
- **ONRR**: Resource is online acting as a synchronous condenser and available for RUC commitment
- **OUT**: Resource is not available
Formation of Resource Constraints in RUC
Topics in this Section Include

1. Temporal Constraints
2. Combined Cycle Transitions
3. Split Generation Resources
RUC will enforce the following Temporal Constraints for Available Resources

- Start time (Hot, cold or Intermediate)
- Min On-Line Time
- Max On-Line Time
- Min Off-Line Time
- Maximum Daily Starts
Topics in this Section Include

1. Temporal Constraints
2. Combined Cycle Transitions
3. Split Generation Resources
Committing Combined Cycle Plants in RUC

- QSE may make all configurations available
- RUC may commit
  - Only one configuration per hour
  - Transitions in accordance with registered transition matrix
Topics in this Section Include

1. Temporal Constraints
2. Combined Cycle Transitions
3. Split Generation Resources
Resource MPD is set up as two Split Generation Resources (SGR)

Each QSE provides a Current Operating Plan

- If one SGR is “OUT,” all are “OUT”
- Otherwise, if one SGR is “ON,” all are “ON”

Suppose each QSE shows a COP Status of “OFF.” Can RUC commit just one SGR?
The Mind of RUC
The Mind of RUC

- Resource Commitments
- Undeliverable Ancillary Service
- Ancillary Service
- Transmission Security Analysis (TSA)
- Reliability Unit Commitment (RUC)
- Current Operating Plans
- Network Operations Model
- Contingencies
- Load Forecast
- Offers
- Resource Commitments
- Resource Decommitments
- Undeliverable Ancillary Service

Reliability Unit Commitment
Two key points about Reliability Unit Commitment:

- The *purpose* of RUC is entirely for Reliability
- The *process* of RUC is a security-constrained *economic* clearing engine
RUC Participation with a Three-Part Supply Offer

In evaluating a Resource for commitment, RUC utilizes:

- Startup Offer (if needed)
- Minimum Energy Offer

The Energy Offer Curve is not used by RUC
RUC Participation **Without** Three-Part Supply Offer

Use 150% Approved Verifiable Costs

or

Use 150% Resource Generic Costs

**ERCOT creates offer for all hours where:**
- COP Status is “OFF”
- No QSE-submitted Three-Part Supply Offer
Proxy Energy Offer Curve

- Allows RUC to calculate a “dispatch solution”
- Projects congestion patterns for TSA
- Derived from Mitigated Offer Caps

![Graphs showing Mitigated Offer Curve and Proxy Energy Offer](image-url)
RUC Objective:

• Commit Resources (if necessary) at minimum cost
• Subject to various constraints
  • Security constraints
    • Power Balance Constraint
    • Transmission Constraints
  • Resource constraints
RUC Objective:

Minimize:

\[ \text{StartupCosts}_{\text{uncommitted}} + \text{MinEnergyCosts}_{\text{uncommitted}} + \text{ProxyEnergyCosts}_{\text{uncommitted}} + \text{ProxyEnergyCosts}_{\text{committed}} + \text{TransitionCosts}_{\text{CCunit}} + \text{Penalty Costs} \]
**RUC Objective:**

Penalty Costs are assigned costs for violating the following constraints:

- Power Balance Constraint
- Transmission Constraints
- Preservation of reserved Ancillary Services per AS Type
RUC needs to commit an additional 100MW in a specific location to avoid violating a transmission constraint.

There are two possible solutions:
1. Start Resource LilGen1 from a cold state.
2. Transition the URChiep Combined Cycle Train to a configuration with a greater HSL.

• How does RUC determine which Resource to choose?
A Resource is planned to be on-line as a Synchronous Condenser and providing Responsive Reserve Service. The Resource’s COP status is ONRR.

- Resource is eligible for commitment by RUC
- What must happen economically for RUC to commit the Resource?
Scenario 3

A Resource is planned to be off-line and providing Non-Spin Reserve Service. The Resource’s COP status is OFFNS.

- While not normally eligible for commitment by RUC, RUC can utilize this Resource under the right circumstances
- What must happen for RUC to commit this Resource?
- What would happen to the Non-Spin Quantity reserve on this Resource?
The Reliability Unit Commitment Process

- Current Operating Plans
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Offers

Transmission Security Analysis (TSA)

Reliability Unit Commitment (RUC)

Reliability Unit Commitment

Resource Commitments

Resource Decommitments

Undeliverable Ancillary Service

I approve
RUC Dispatch Instructions

- RUC time stamp
- RUC commitment
- RUC decommitment and the corresponding reason code
- Undeliverable Ancillary Service Capacity
QSE Responsibilities
Post-RUC
Resource committed by RUC?

QSE Responsibilities Post-RUC

QSE must update COP within 60 minutes
- ONRUC
- ONOPTOUT

Reliability Unit Commitment

Committed for Energy

Committed for Ancillary Services

Resource must run during instructed hours
Energy Offer Curve for RUC-Committed Resource

- All energy above LSL subject to offer floor
- QSE may update by end of Adjustment Period
- ERCOT will adjust if QSE does not

Applies only to hours in the RUC-commitment Period
A QSE is “Buying Back” the RUC Commitment

Operational impacts
• Must start/run resource if available
• May provide ancillary services

Financial impacts
• No RUC financial settlements apply
• No requirement for energy to be priced at or above $1500
If Choosing ONOPTOUT Status

Telemetry Requirements and Confirmation

QSE requirements

- Must telemeter ONOPTOUT status
  - First SCED run Resource is available for dispatch
  - First hour of RUC Commitment

ERCOT requirements

- Set BUYBACK flag to “1”
- Send XML confirmation to QSE
Resource committed by RUC?

QSE Responsibilities Post-RUC

QSE must update COP within 60 minutes

- ONRUC
- ONOPTOUT

Reliability Unit Commitment

Committed for Energy

Committed for Ancillary Services

QSE must reserve Ancillary Services on appropriate Resources
Undeliverable Ancillary Service?

QSE may choose to
• Substitute
• Trade
• Instruct ERCOT to replace

ERCOT uses the Supplemental Ancillary Services Market (SASM) to replace undeliverables
Undeliverable Ancillary Service?

Financial impacts
- Return anything they were paid in DAM
- Still responsible for any Ancillary Service Obligations they have

ERCOT uses the Supplemental Ancillary Services Market (SASM) to replace undeliverables
Settlement of RUC-Committed Resources included with Real-Time Settlements

We will return to this topic later!
You’ve learned about ...

• The Reliability Unit Commitment (RUC) Process
• Formation of Resource Constraints in RUC
• The Mind of RUC
• QSE Responsibilities post-RUC