

RTS Energy and Transaction Market Rules

MSWG

7/8/03

Agenda

- *SCUC*
 - ▶ Changes for Day-Ahead
- *RTS*
 - ▶ RTC
 - ▶ RTD
 - ▶ RTD-CAM
- *Generator Bidding*
 - ▶ On-dispatch
 - ▶ Self-scheduled flexible
 - ▶ Self-scheduled fixed
- *Transaction Bidding*

SCUC Changes for SMD2

- **MP may specify:**
 - *Startup cost as a function of the number of hours since shutdown (increasing or decreasing)*
 - *Or a unique startup cost for specific hours of the day*
- **Allowable number of price/quantity pairs increased to 12 for the incremental energy bid curve.**
- **Control area specific ramp constraints.**
- **Reserve Demand Curves for each category and locational reserve constraint.**
- **SCUC can be run with Normal UOL or Emergency UOLs.**

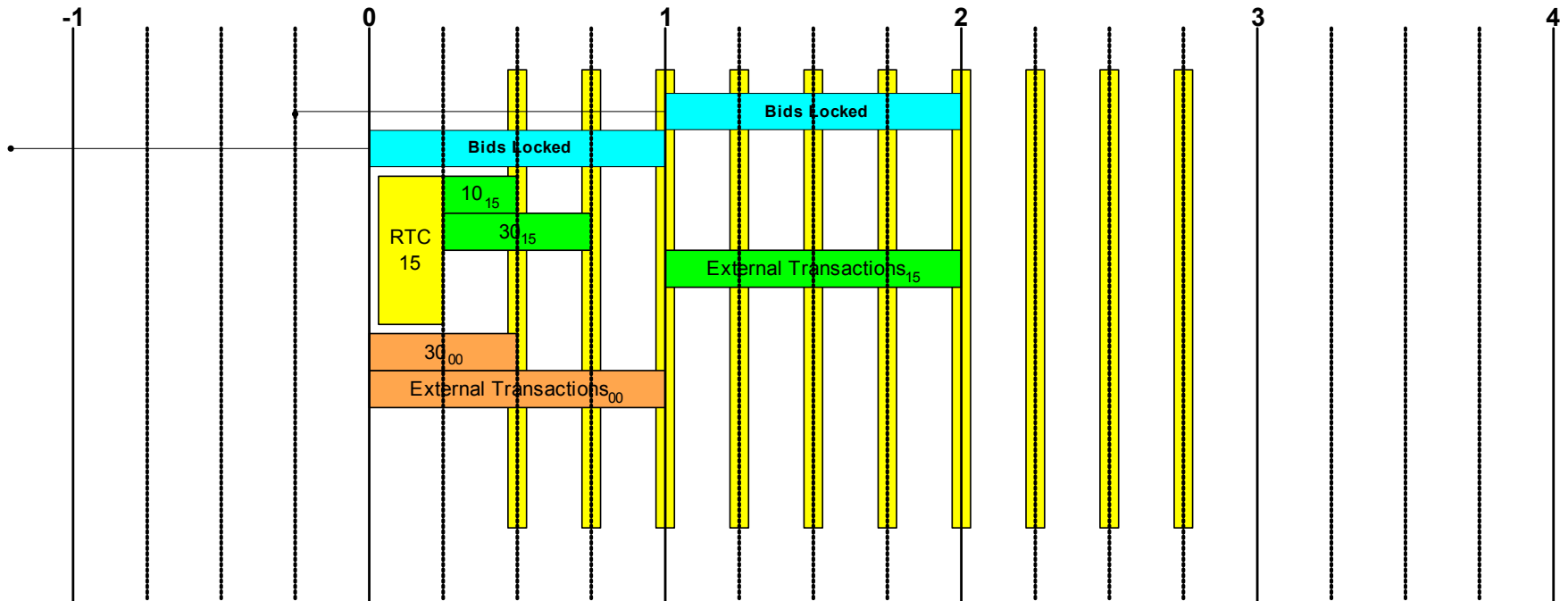
RTS Overview

➤ RTC

- *Multi-period security constrained unit commitment & dispatch*
- *Co-optimizes to simultaneously solve load, regulation & reserves.*
- *Runs every 15 minutes, opt. over 10 1/4hr periods – total 2 ½ hours*
- *Issues binding commitments for unit starts at 15 & 30 minutes out.*
- *Unit shutdown decisions are not binding until the RTC run immediately before the scheduled shutdown.*
- *RTC₁₅ schedules transactions to start at the top of the next hour.*
- *RTC_{30, 45 and 00} may reduce specific transactions to maintain feasibility, but will not pass those curtailments to IS+. RTC will issue alarms and the Operators will make appropriate curtailments if necessary within the hour.*
- *RTC₁₅ posts at time 15 and opt. From T₃₀ through T₁₈₀*

RTS Timeline

➤ RTC



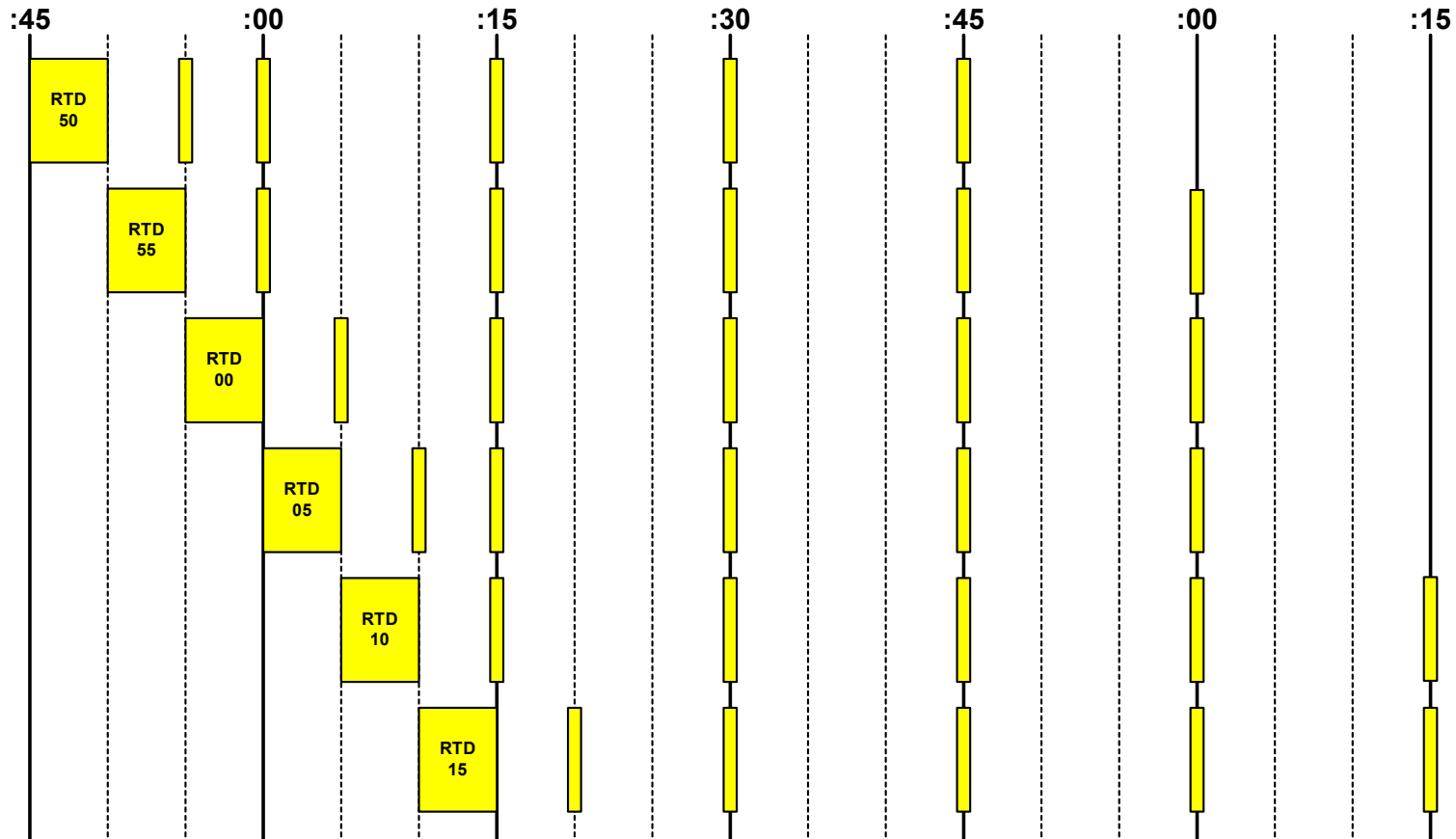
RTS Overview

➤ **RTD**

- *Multi-period security constrained dispatch*
- *Co-optimizes to simultaneously solve load, regulation & reserves using RTC committed units.*
- *Runs nominally every 5 minutes*
 - ▶ Energy and ancillary services scheduled and priced every 5 minutes in RTD
- *Optimizes over a 60 minute period*
- *RTD₁₅ posts at time 15 and opt. From T₁₅ through T₇₅*

RTS Timeline

➤ RTD



RTS Overview

➤ **RTD-CAM**

▪ *Run On-Demand by the Operators*

- ▶ Reserve pickup - reestablish the NYISO net interchange schedule after major system events caused by the loss of transmission lines or generators
- ▶ Reserve restoration - reestablish reserves following a reserve pickup
- ▶ Max Gen pickup - increase generation in selected locations at emergency rates
- ▶ Base points ASAP, no commitments - calculate base points to correct line, contingency or transfer overloads and/or voltage problems caused by unexpected system events
- ▶ Base points ASAP, commit as needed - calculate base points and commit 10-minute units to correct line, contingency or transfer overloads and/or voltage problems caused by unexpected system events

Generator Bids

Bid Parameters	Description
General Bidding Features	<ul style="list-style-type: none"> • 3-part bidding in real-time permitted for all units (startup cost, minimum generation cost and incremental energy bids). • Bids may change hourly and will be locked 75 Minutes before the beginning of each hour. • Price under DAM scheduled portion of bid curve cannot be increased in the real-time market. • A valid bid is required at all times over the full range of the unit being offered or have scheduled the unit on an outage.
Gas Turbine Bidding	<ul style="list-style-type: none"> • GTs may choose to submit bids with a minimum operating level plus a dispatchable range. A GT that chooses a minimum operating level equal to its maximum operating level will be treated as gas turbines are today. • GTs with a DAM schedule will not be made must-run in real-time as they are today in BME. • In RTD-CAM, off-line GT bids shall be modified by their start-up costs and amortized over a one hour window for commitment evaluation. Once committed, will be dispatched using as-bid values.

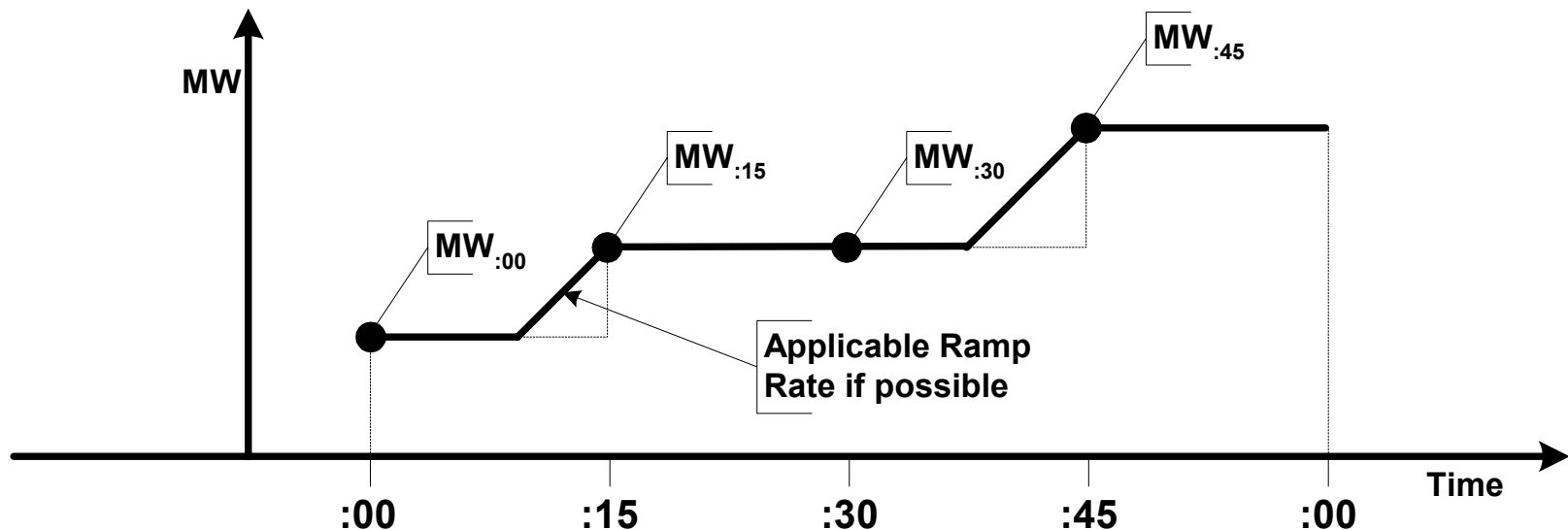
Generator Bids

Bid Parameters	Description
Unit Status	<ul style="list-style-type: none"> • On-Dispatch – ISO committed and dispatched. Unit follows a 5 minute (or 6 second) basepoint. • Self-Scheduled Flexible – MP self-committed and self-scheduled lower limit with a dispatchable range. Unit follows a 5-minute (or 6 second) basepoint above a MP specified lower limit. • Self-Scheduled Fixed – MP committed and MP provided fixed schedule in real-time. Option for ISO commitment and scheduling in the DAM.
Upper Operating Limit (UOL)	<ul style="list-style-type: none"> • All units specify both a Normal and Emergency UOL. • E_{UOL} must be $\geq N_{UOL}$ • Procedures will dictate which is used Day-Ahead. • Operators may call for Emergency UOL operation in-day.
Self-Schedule MW	<ul style="list-style-type: none"> • Self-scheduled units provide an explicit MW schedule amount that can be different for each $\frac{1}{4}$ period in an hour. • Self-scheduled MWs are a single hourly value in the day-ahead.

Generator Bids

➤ Self-scheduled fixed resources

- Do not follow economic dispatch instructions
- Submit MW schedule for the upcoming hour using the self-scheduled MW parameters.
- The 4 self-scheduled MW parameters specify output at the beginning of the first, second, third, and fourth quarter hour periods.
- Bidder must ensure that the change in output from one quarter hour period to the next is consistent with the ramp rate of the resource.
- When consistent with ramp rate, the profile of the actual energy output rate for the hour will be determined by applying the applicable ramp rate. When incompatible, the specified output level takes precedence over the ramp rate of the unit.



Generator Bids

Allowable Unit Status for bids between Day-Ahead and Real-Time

		Real Time		
		On Dispatch	Flexible	Fixed
Day Ahead	On Dispatch	Yes	Yes	By exception only
	Flexible	N/A	Yes	By exception only
	Fixed, Economic Evaluation	No	No	Yes
	Fixed, Self-Committed	No	No	Yes
	Fixed, Economic Evaluation	No	No	Yes

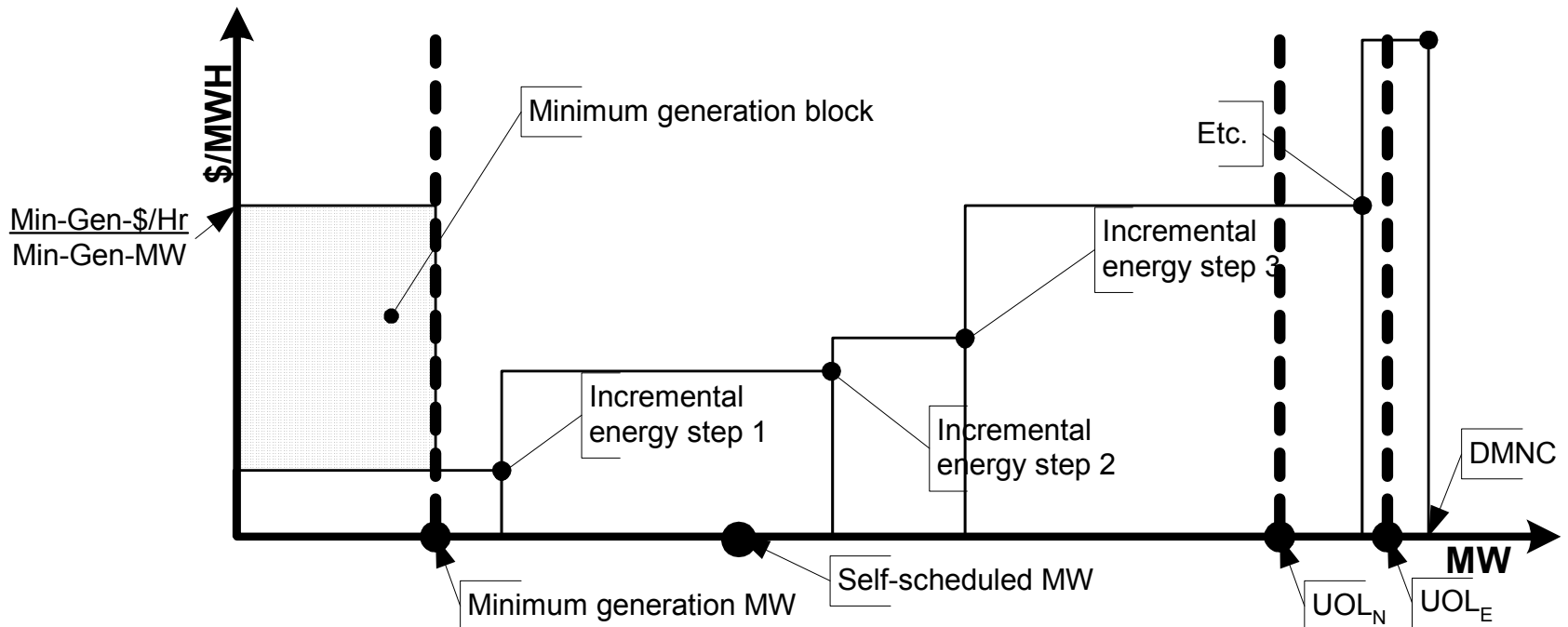
Note: On-dispatch units will be permitted to bid as a fixed unit in the real-time market to manage their startup ahead of their DAM schedule.

Generator Bids

Bid Parameters	Description
Startup Cost Bid Representation	<p>Can choose between a startup cost defined by:</p> <ul style="list-style-type: none"> • Startup cost as a function of the number of hours since shutdown (increasing or decreasing) • Or a unique startup cost for each hour of the day. • Where a startup cost is specified for a given hour, it will override the cost curve value.
Minimum Generation Bid	<ul style="list-style-type: none"> • Minimum generation operating level is defined by a MW level • Minimum generation cost is defined by a total minimum generation cost in \$ per hour to operate at the min gen MW. • Min Gen values may change hourly.
Incremental Energy Bid	<ul style="list-style-type: none"> • Like SCUC today, RTS will use only block bids (Curves are eliminated) • Allowable number of price/quantity pairs increased to 12 in both SCUC and RTS • Must have monotonically increasing bid prices

Generator Bids

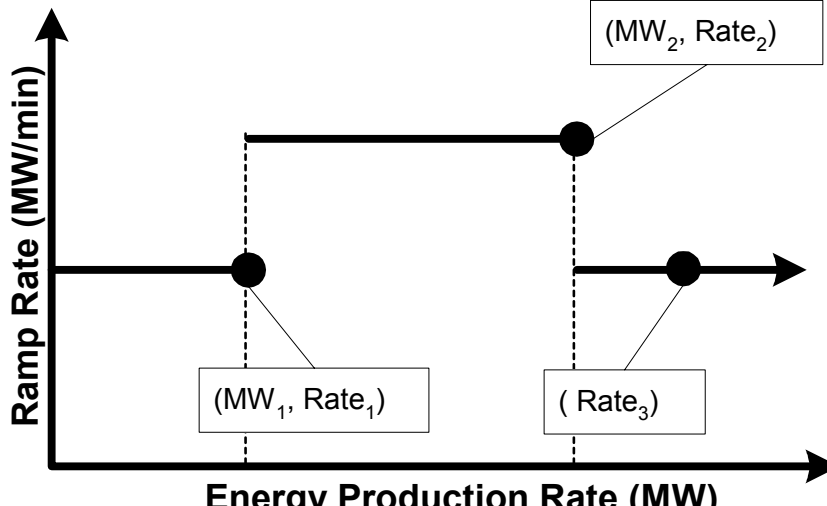
- Incremental energy bids are represented by up to 12 steps as shown below. Each “step” is defined by a pair of numbers that give the energy output rate (MW) and incremental cost (\$/MWh). The steps must be monotonically increasing and must cover the full operating range of the resource.



Generator Inter-Temporal Constraints

Parameter	Description
Minimum run time	The minimum amount of time for which an energy resource can be committed. The maximum value allowed in RTC is 1 hour.
Startup time	The time needed start and synchronize the resource and load the resource to its minimum generation level. RTC can commit resources with a startup time of 30 minutes or less.
Minimum down time	Minimum time that must elapse between shutdown of an energy resource and its next commitment (startup). Value must be in the range zero to 168 hours.
Maximum stops per day	RTC will monitor, but not enforce the “maximum stops per day” parameter. This parameter is used only by SCUC.

Generator Inter-Temporal Constraints

Parameter	Description
<p>Normal ramp rate</p>	<p>Up to three response rates (MW/min) can be specified for normal operations as shown below. The applicable operating range must be given if more than one normal response is specified.</p> 
<p>Emergency ramp rate</p>	<p>Response rate (MW/min) that a unit is capable of during the corrective actions of reserve pickup and maximum generation pickup.</p>

Transaction Bids

Transaction Bids	Description
General Rules	<ul style="list-style-type: none"> • SCUC - bid hourly or as multi-hour block transactions • RTS – bid hourly for all types of transactions
ICAP Pre-scheduled Transactions	<ul style="list-style-type: none"> • A limited form of pre-scheduled transactions, on an hourly basis are being implemented to accommodate external ICAP deliverability rules • ICAP transactions will be tracked in MIS and assigned pre-schedule status by the operators when called on by the external control area. • ICAP pre-schedules will have the highest economic scheduling priority.
Economic Transactions	<ul style="list-style-type: none"> • Economic evaluation will be hourly • Must be submitted 75 minutes before the start of the hour • Can provide only one MW quantity and one price for the transaction per hour