Multiple Ramp Rate Study in ERCOT Balancing Energy Market

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ERCOT Market Operations Support

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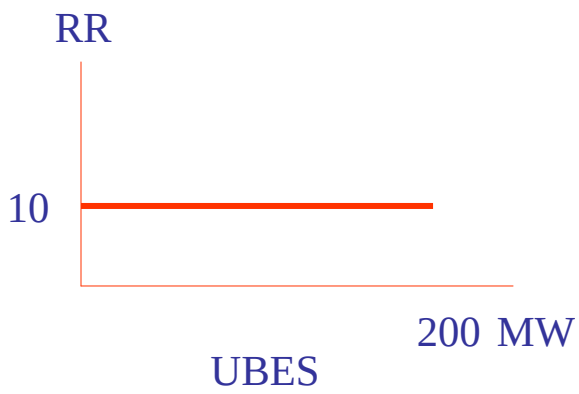
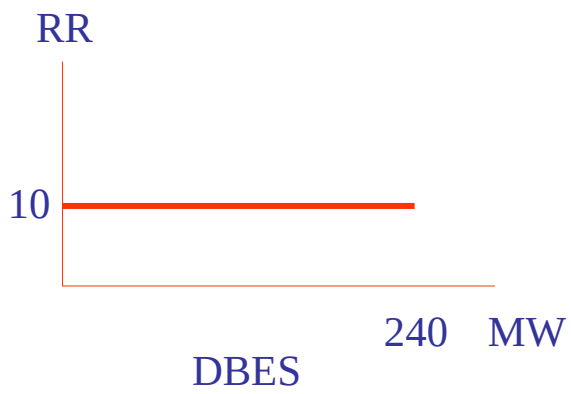
Single Ramp Rate

QSE	Type	Bid MW	Ramp Rate
A	UBES	100	10
A	UBES	200	
A	DBES	120	10
A	DBES	240	

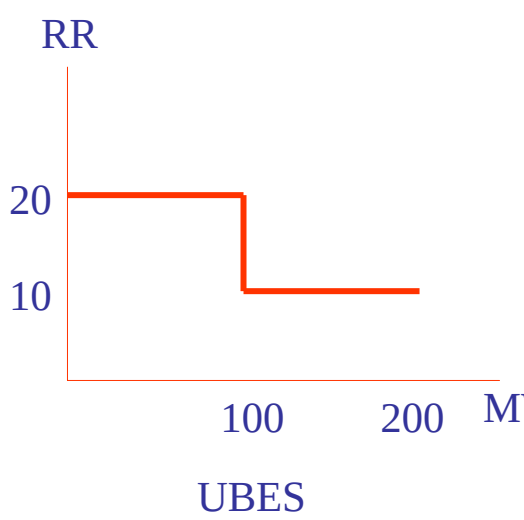


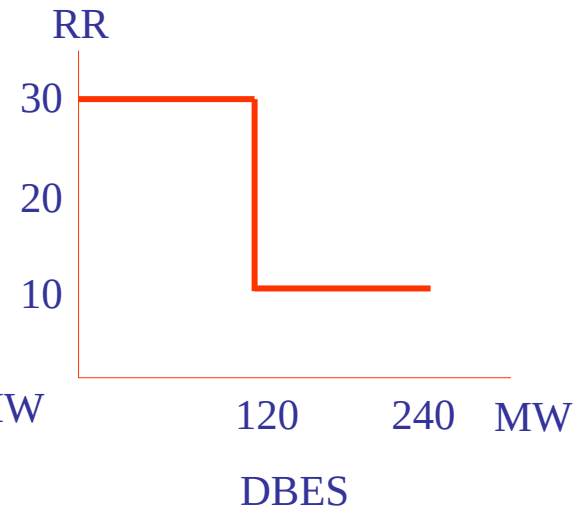


Multiple Ramp Rate

Multiple Ramp-Rate Bid-1

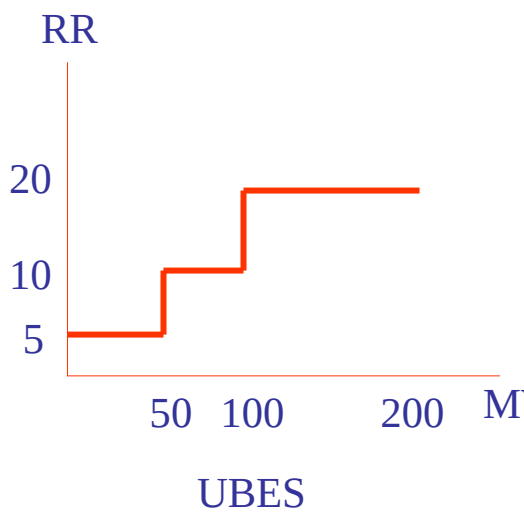
QSE	Type	Bid MW	Ramp Rate
A	UBES	100	20
A	UBES	200	10
A	DBES	120	30
A	DBES	240	10

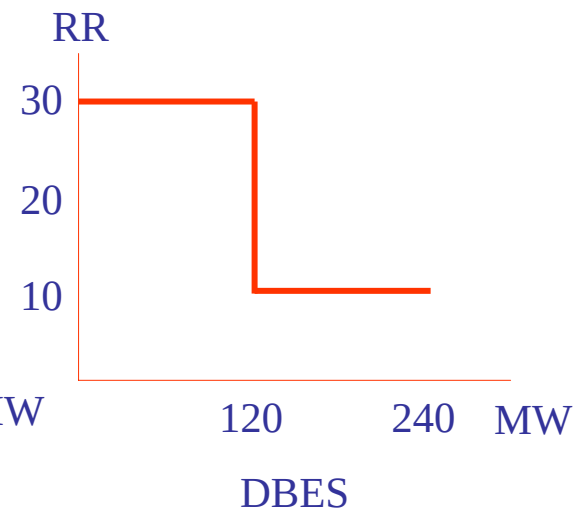




Multiple Ramp-Rate Bid-2

QSE	Type	Bid MW	Ramp Rate
A	UBES	50	5
A	UBES	100	10
A	UBES	200	20
A	DBES	120	30
A	DBES	240	10





Ramp Rate Constrained Balancing Deployment Range

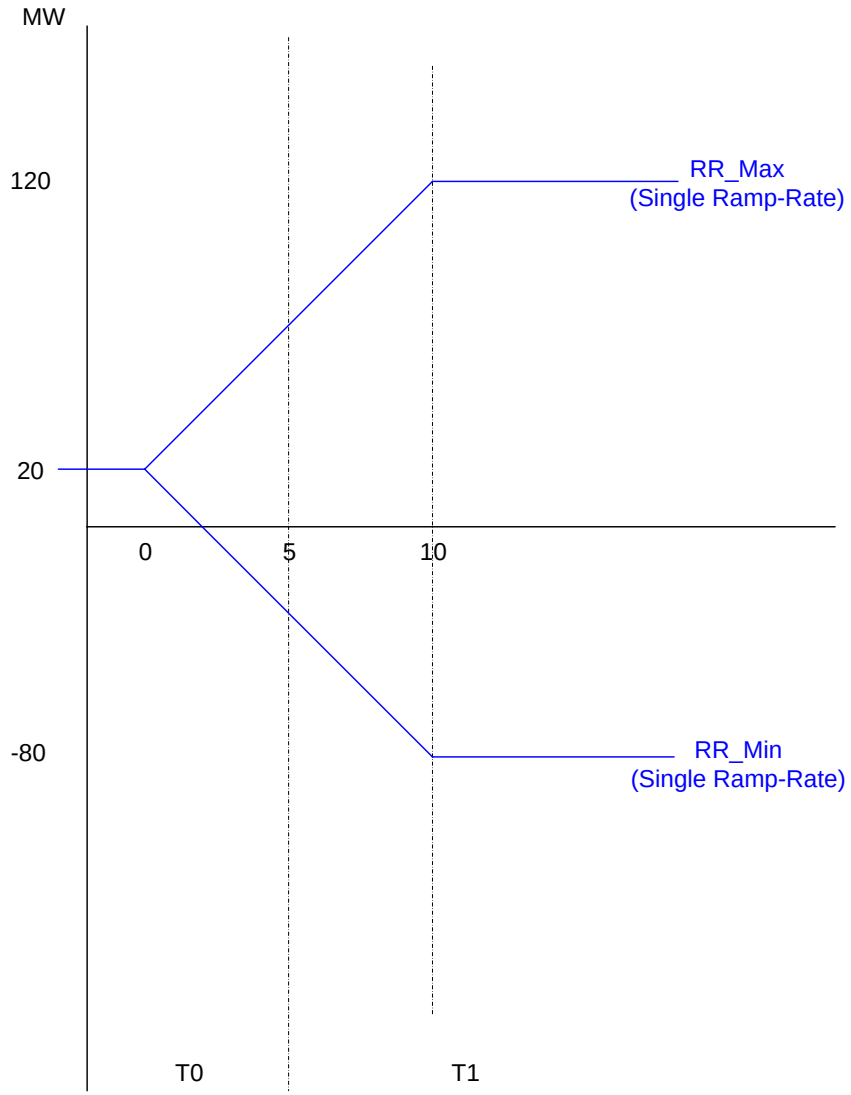
RR_Max:

The maximum amount of net Balancing Energy that can be deployed from the portfolio in the target interval

RR_Min:

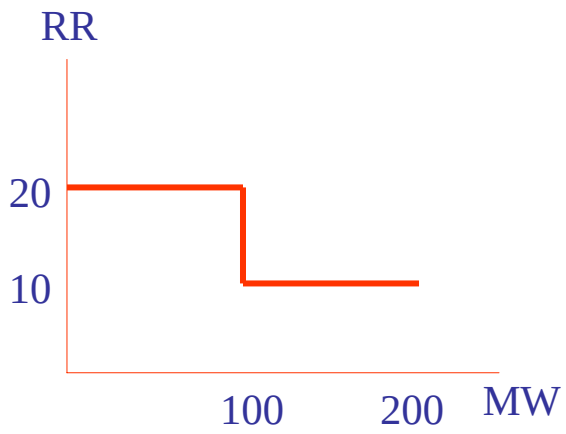
The minimum amount of net Balancing Energy that can be deployed from the portfolio in the target interval

RR_Max & RR_Min are calculated in ERCOT SPD (Scheduling, Pricing and Dispatching) engine to clear real time balancing energy market

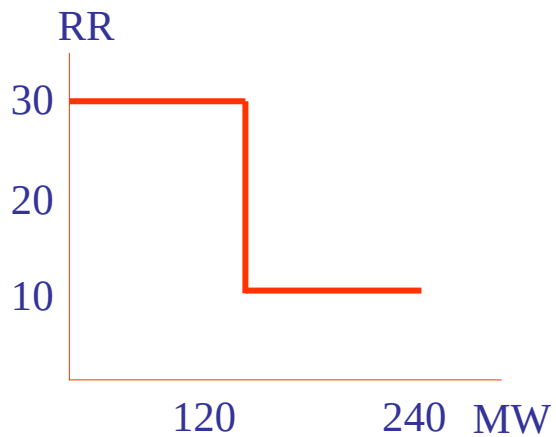


Balancing Deployment Availability

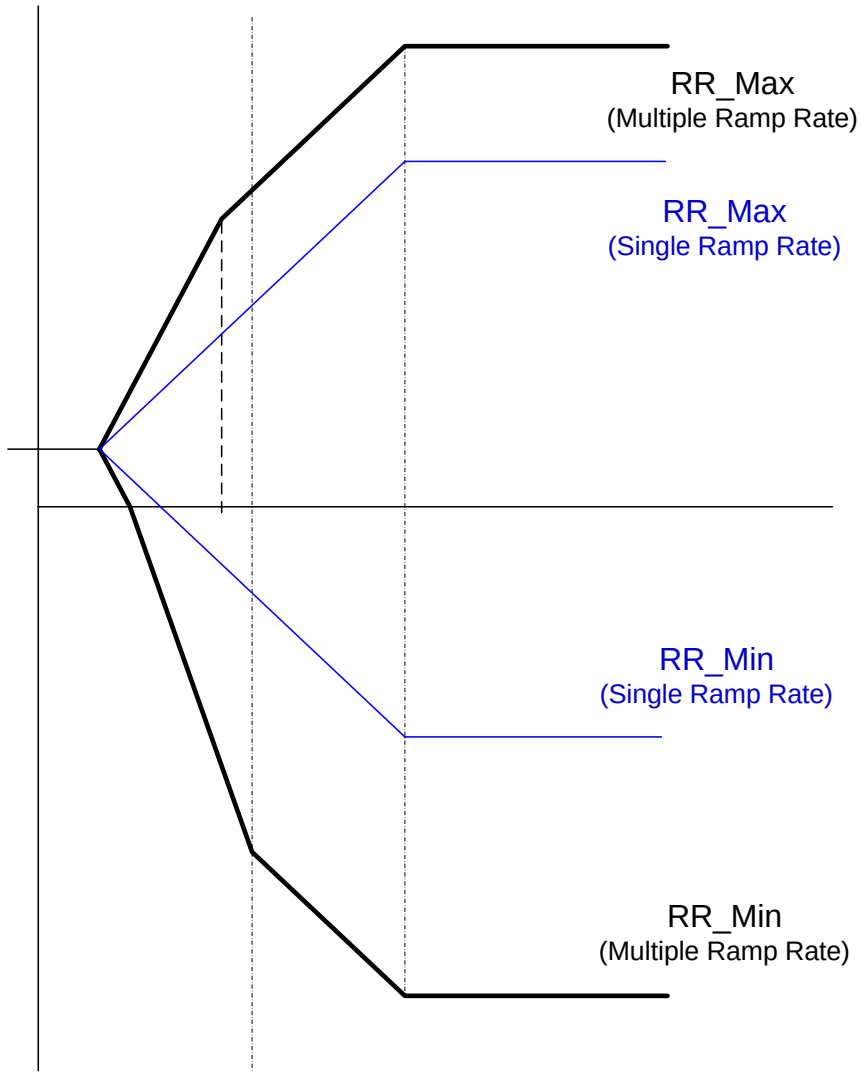
Multiple Ramp-Rate Bid-1



UBES

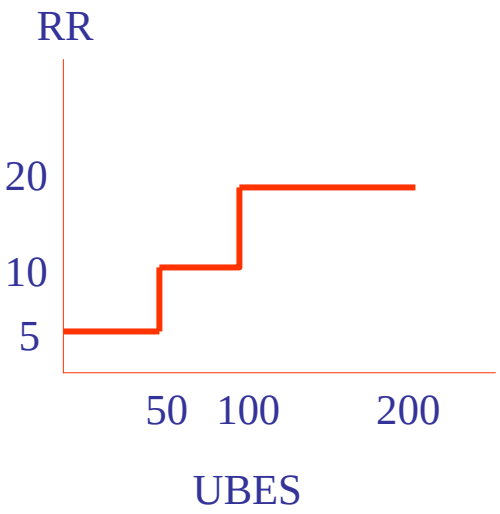


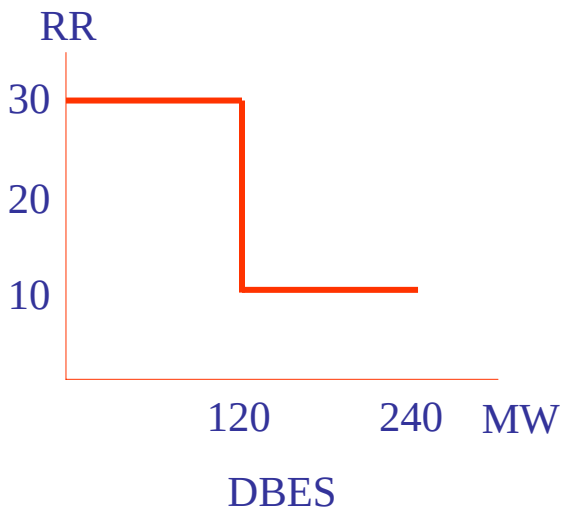
DBES

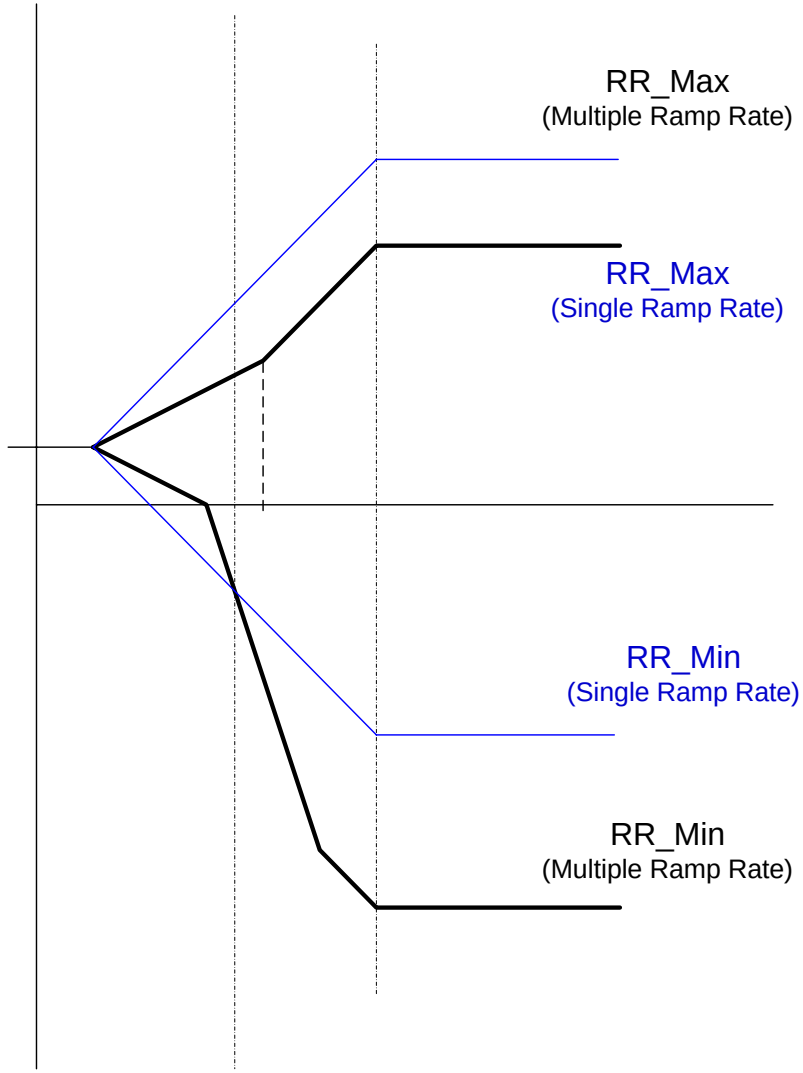


Balancing Deployment Availability-Bid 2

Multiple Ramp-Rate Bid-2







Two Alternatives

- I: Market System Changes, No SPD change

- II: Market System Changes and SPD change.

Alternative I

- No SPD changes, but market system changes
  - QSEs submit the multiple ramp rate curve together with the balancing bids,
  - Both XML/Portal and market database will be changed,
  - A specific ramp rate will be used before clearing the balancing market.

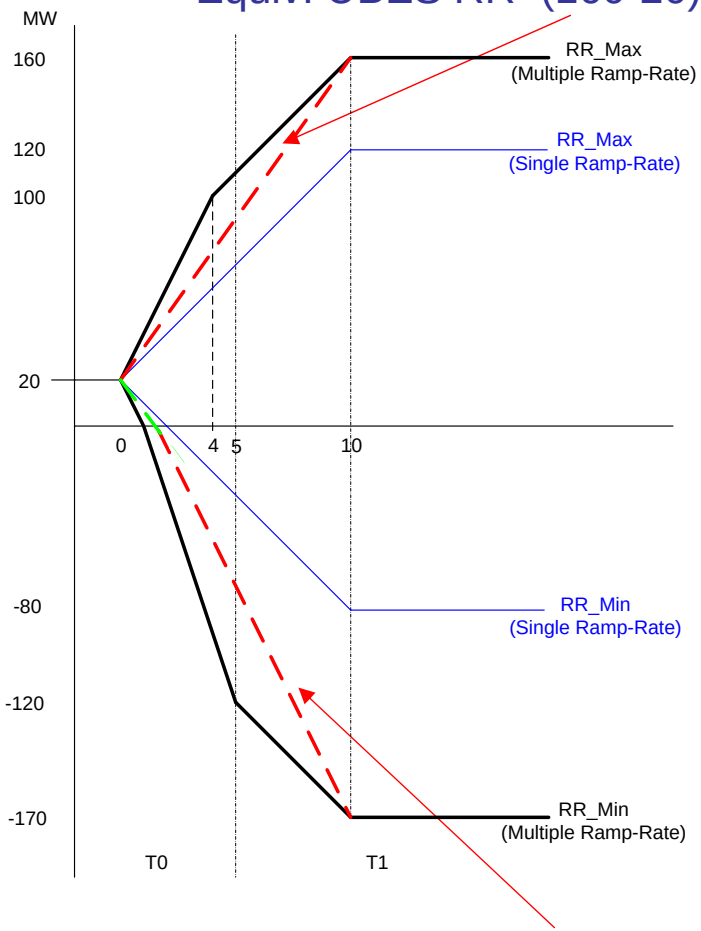
- Major Task
  - Calculate some equivalent ramp-rates using a stored procedure in MDB,
  - Pass the calculated ramp-rates to SPD.

- Limitation
  - How to Handle Ramp Rate Recall?

Preprocess out of Market Clearing Engine

Bid-1

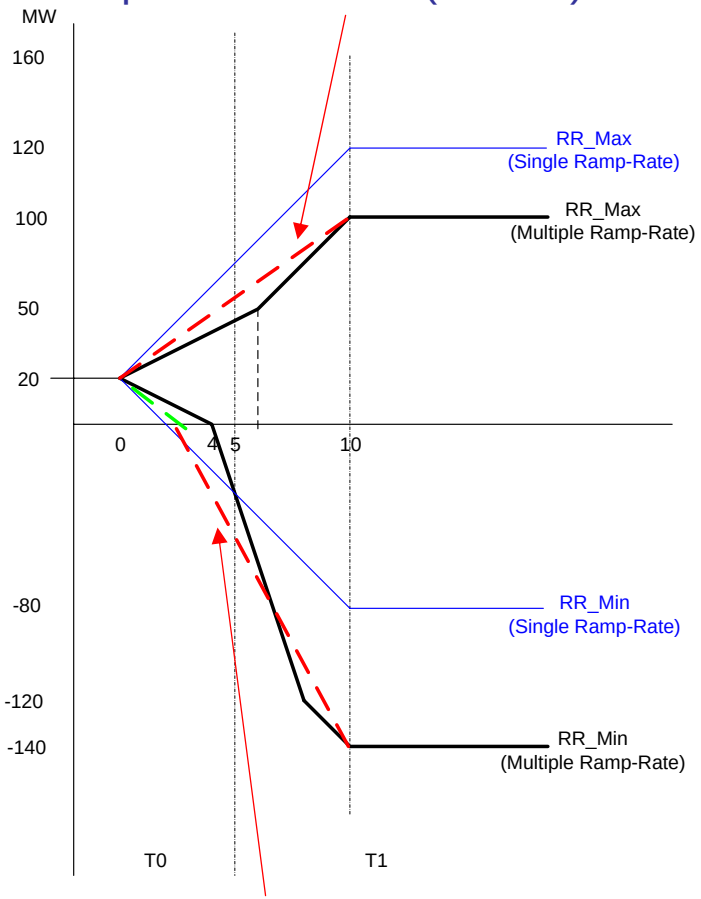
Equiv. UBES RR=(160-20)/10=14



Equiv. DBES RR=(170-0)/(10-1.43)=19.8

Bid-2

Equiv. UBES RR=(100-20)/10=8



Equiv. DBES RR=(140-0)/(10-2.5)=18.7

Alternative II

- With both SPD and market system changes
  - QSEs submit the multiple ramp rate curve together with the balancing bids,
  - Both XML/Portal and market database will be changed,
  - Modify SPD to accommodate the multiple ramp rate.

Alternative II

- Modify SPD to accommodate the multiple ramp-rates
  - Modify bid data structure and the associated preprocess procedures,
  - Modify the ramp-rate recall constraint model,
  - Modify UBES/DBES directional ramp-rate constrain model in Step 2,
  - Modify the logic to determine the impact of OOME ID and Step2 ID,
  - Modify the logic to determine the “price taker” MW for a QSE bid,
  - Review the entire SPD code to make sure the things are consistent
  - Perform significant unit and regression testing, including all the scenarios for ramp-rate recall and OOME/Step2 ID model,
  - Modify SPD display/output to support this new function.

Summary

Alternative	I	II
Resource	ERCOT Internal	AREVA
Technical Feasibility	Yes	Yes
Known Cost (Approx.)	Pre-Processing for deriving equivalent ramp-rate: $15,000	SPD Modification: $200,000
Unknown Cost	XML, Portal, MDB, and Participant-related cost, etc.	XML, Portal, MDB, and Participant-related cost, etc.
Benefit	??	??
Limits	1. Approximate ramp-rates still, 2. Inaccurate ramp-rate when RR_recall exists, 3. Possible performance impact due to this additional pre-processing step,	1. Huge and complicated task since almost everything done in R3 will need to be either redesigned/re-implemented/retested or reviewed/retested, 2. SPD performance issue due to additional logics in a variety of models, 3. Prototype engine needs to be built to give accurate assessment

Questions