



Topaz Power Group LLC

Quick Start Task Force Meeting

October 23, 2009

Austin, Texas

Summary

- Real-Time Economic Unit Commitment
 - Problems, Benefits
 - Bid Stack Issues
 - Proposed Zonal PRR
 - Market comparison
- 10MNSRS
- Action Items

Nodal Quick Start UC Problems

- Reliance on HRUC is **undesirable**
 - Reliability commitment and uplift should be minimized
- Reliance on self-commitment is **undesirable**
 - Only ERCOT has sufficient information for optimal unit commitment decisions
 - Will impair Nodal **promised substantial efficiency improvements**
 - Introduces price risk not present in DAM



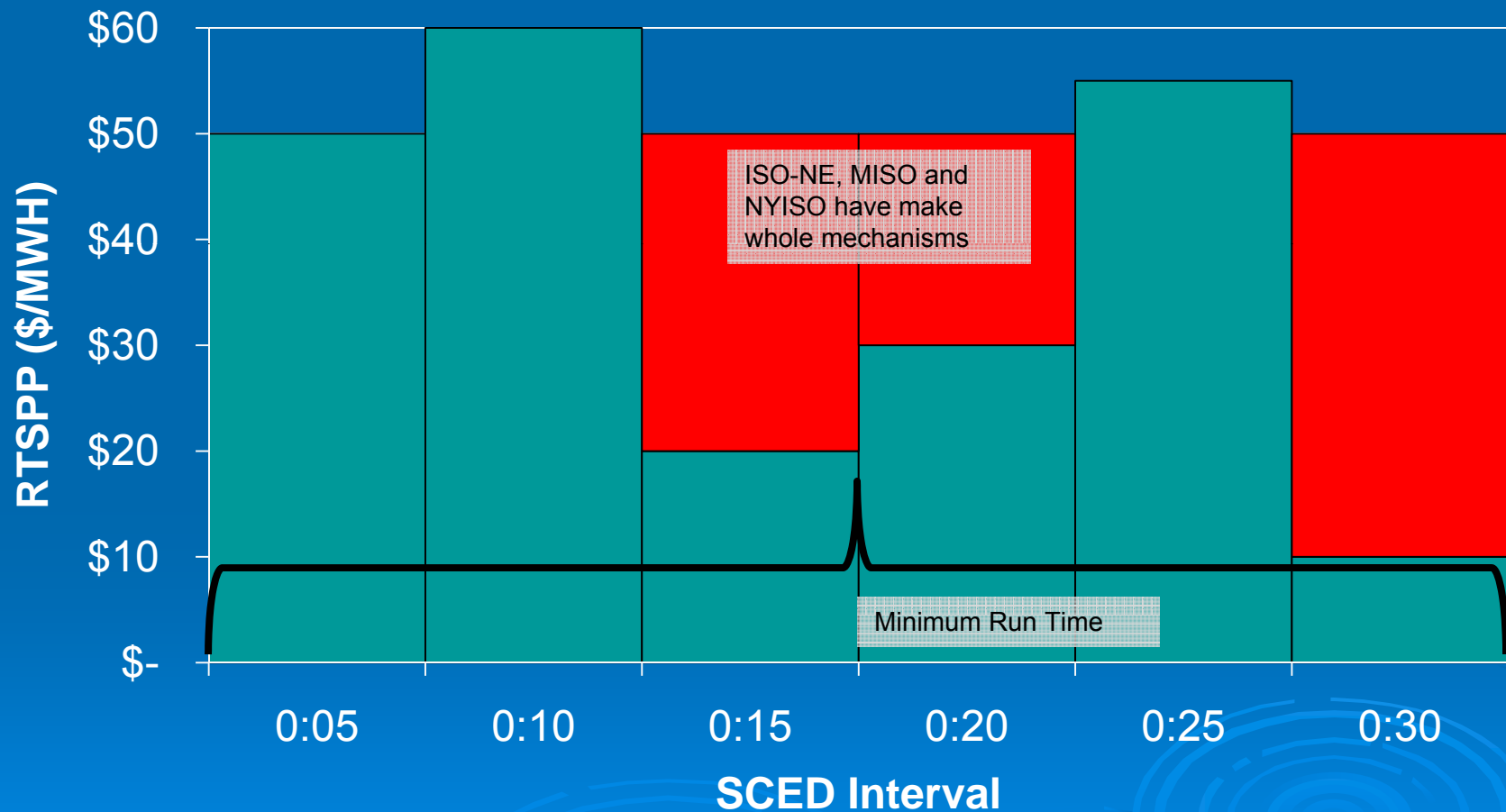
RTEUC Benefits

- Extend bid stack by 5,000+ MW
- Reduce uplifted RUC costs
- Introduce competitive solutions to complement wind
- Enable competitive solutions to temporal ramp rate driven issues
- Improve convergence between day-ahead and real-time markets
- Incent investment in innovative technology

RTEUC Issues

- Minimum Run Time
- Start-Up Costs
- Non-zero LSL
- Make-Whole Payment

Minimum Run Time Issue



QS Bid Stack Issues

➤ Resource A

- Next least expensive offer(s)

➤ Resource B

- Next more expensive offer(s)

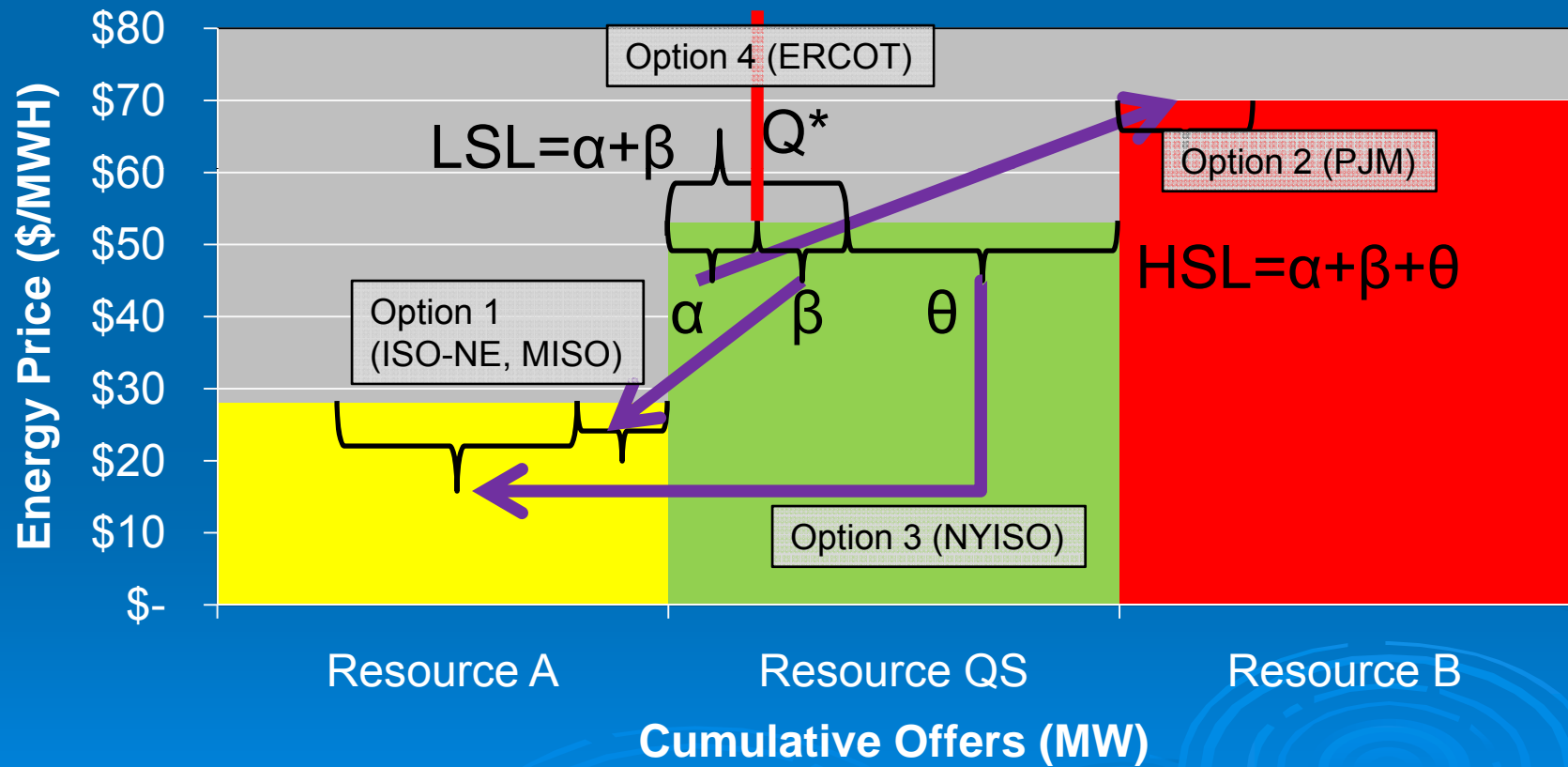
➤ Resource QS (Quick Start Unit)

- $LSL = \alpha + \beta$; LSL listed as zero in offer ONLY
- Cannot physically operate less than LSL
- $HSL = \alpha + \beta + \theta$

➤ Q^* = desired MW quantity

Pricing Clearing Issue

Example Supply Stack



Option 1

- Resource QS
 - Operates at LSL (above Base Point)
- Procure
 - $+\beta$ from Resource QS
 - $-\beta$ from Resource A
- MISO, ISO-NE On-line during min run time

Option 2

- Resource B clears price
- Procure
 - α from Resource B
 - No energy from Resource QS
- PJM

Option 3

- Resource QS
 - Clears price
 - Operates at HSL
- Procure
 - $+(\beta + \theta)$ from Resource QS
 - $-(\beta + \theta)$ from Resource A
- NYISO Hybrid Pricing

Option 4

- Resource QS
 - Clears price
 - Operates at LSL (above Base Point)
- Procure
 - $+\beta$ from Resource QS
 - $-\beta$ from Regulation (inherently)
- ERCOT Zonal, ISO-NE Off-line & On-line past minimum run time

Option Comparison

Option	Advantage	Disadvantage
Option 1	<u>Enables QS participation</u> Utilizes QS flexibility May reduce price volatility May reduce prices	Re-dispatches economic Resources May require Make-Whole Payment QS operates at least efficient point
Option 2	Easy to implement	Ignores QS Units Artificially increases prices
Option 3	<u>Enables QS participation</u> QS operates at most efficient point May reduce price volatility May reduce prices	Same as Option 1, but requires more re-dispatch Assumes inflexible QSU operation
<u>Option 4</u> Current	Easiest to implement	Ignores LSL <u>Exposes QSU to URC, SCE, Base-Point Deviation Charge</u>

ERCOT Zonal

- ERCOT currently utilizes Option 4
 - QSU clears market
- Proposed PRR
 - Enables QSE to dispute for URC in such Settlement Intervals
 - Removes such Settlement Intervals from SCE calculation

RTEUC Comparison

Market	RTEUC	LSL>0	Min Run Time	Make-Whole Payment	Start-Up Cost
ERCOT Zonal	QSBES MP shows Unit as On-line	LSL = 0 β in Regulation	15 minutes	None	MP must include in QSBES offer
NYISO	RTC 15 & 30 min RTD-CAM 10 min	Assumes HSL $\beta + \theta$ from re-dispatch	1 hour	Bid Production Cost Guarantee	Amortized over 1 hour Added to incremental energy offer
ISO-NE	UDS ~15 minutes	β from re-dispatch	1 hour	Net Commitment Period Compensation (NCPC)	Amortized over 1 hour Added to incremental energy offer
MISO	IRAC	β from re-dispatch	Resource specific	Revenue Sufficiency Guarantee (RSG)	Amortized over expected need for QS Unit



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10MNSRS

Benefits

- Avoids cost related to sub-optimal operation of On-line reserved capacity
- Provides intermediate mechanism to ensure reliability between RRS and NSRS
- Encourage investment in innovative technology

Justification

- Recommended in GE Wind Report
 - Continuous wind ramping events versus discrete thermal events
- Exists in PJM, CAISO, MISO, ISO-NE and NYISO

Background

- 8,300 MW of Wind
- Supply Side Solution
 - 900 MW existing
 - 550 MW announced
- Over 25 models
 - Cummins, GE, Pratt-Whitney, Rolls-Royce, Siemens, Wärtsilä

Current Zonal Mechanisms

➤ NSRS

- Replace lost capacity
- Load/wind forecast error
- 95% BES exhausted
- EEA Level 1

➤ OOMEVDI

- Local Congestion
- ARR > 2,500 MW
- PRC > 2,300 MW

Proposed Procedures

➤ Procurement

- Context of other AS
- 700 MW = EEA Alert *minus* EEA Level 1

➤ Deployment

- Before RRS or NSRS
- At EEA Level 2
- Maintain PRC

Action Items

➤ RTEUC

- Develop NPRR and supporting material for parking deck prioritization

➤ 10MNSRS

- Develop procurement and deployment guidelines