Basics of Regulation Lost Opportunity Cost

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Objectives

- Criteria for Regulation Lost Opportunity Cost (RegLOC)
- Sample RegLOC Calculation
- Benefit of Providing Regulation with Energy
RegLOC – is the foregone revenue or increase in costs relative to the energy market for providing regulation.

- Calculated only for resources providing energy along with regulation service
- Calculated only for pool scheduled regulation resources
- Is $0 for DSR, and self-schedule and Non-Energy Regulation resources
- Can only be positive, else zero
- Calculated only within Eco limit range
  - Economic Minimum to Economic Maximum range
- RegLOC is a component of the Regulation Market Clearing Price
• **Simplified RegLOC formula**

\[ |LMP - MC| \times GENOFF \]

Where:
- LMP – is the LMP at the resource bus;
- MC – is the resource cost at the regulation set point;
- GENOFF – is the MW deviation from the economic dispatch and the regulation set point

**Note:**
- In the clearing process, forecasted LMP is used
- In the pricing, Real-Time LMP is used
- RegLOC is further adjusted by:
  - Resource Historical Performance Score and
  - Resource Benefit Factor
Regulation Uplift and LOC

- Opportunity Cost if resource must be lowered uneconomically to provide regulation
- Uplift if resource must be raised uneconomically to provide regulation
- LMP calling for min energy output
- LMP calling for max energy output
- RegLOC Energy Schedule

Min Output  RegLo + RegMW  RegHi - RegMW  Max Output

$/MWh
RegLOC Calculation and Benefit for Participating in Regulation Market

- **Energy Only - no Regulation**
  - Energy Credit = LMP*MW = 50*10 = 500
  - Energy Cost = (20*10) + (8*20*0.5) = 280
  - **Energy Revenue = 500 − 280 = 220**

- **Energy with Regulation**
  - Energy Credit = 50*2 = 100
  - Energy Cost = 20*2 = 40
  - Energy Cost not incurred due to RT reduction = (20*8) + (8*20*0.5) = 240
  - **Energy Revenue = 100 − 40 = 60**
  - **RMCP Credit = 30*8 = 240**
  - **LOC = (10*8) + (20*8*0.5) = 160**
  - **Revenue when Energy with Regulation = 60 + 240 = 300**
  - There is an increase in margin of $80 for providing Regulation with Energy rather than Energy only

Reg MW = 8 MW
Reg Offer Price = $0
RegMax = EcoMax = 10MW
RegMin = -10 MW
LMP = $50
Energy cost at regulation set-point = $20

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