Basics of Regulation Lost Opportunity Cost

Michael Olaleye
Real-Time Market Operation
PJM

June 2014

Objectives

- Criteria for Regulation Lost Opportunity Cost (RegLOC)
- Sample RegLOC Calculation
- Benefit of Providing Regulation with Energy

Regulation Lost Opportunity Cost (RegLOC)

- 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

$$|LMP - MC| * GENOFF$$

Where:

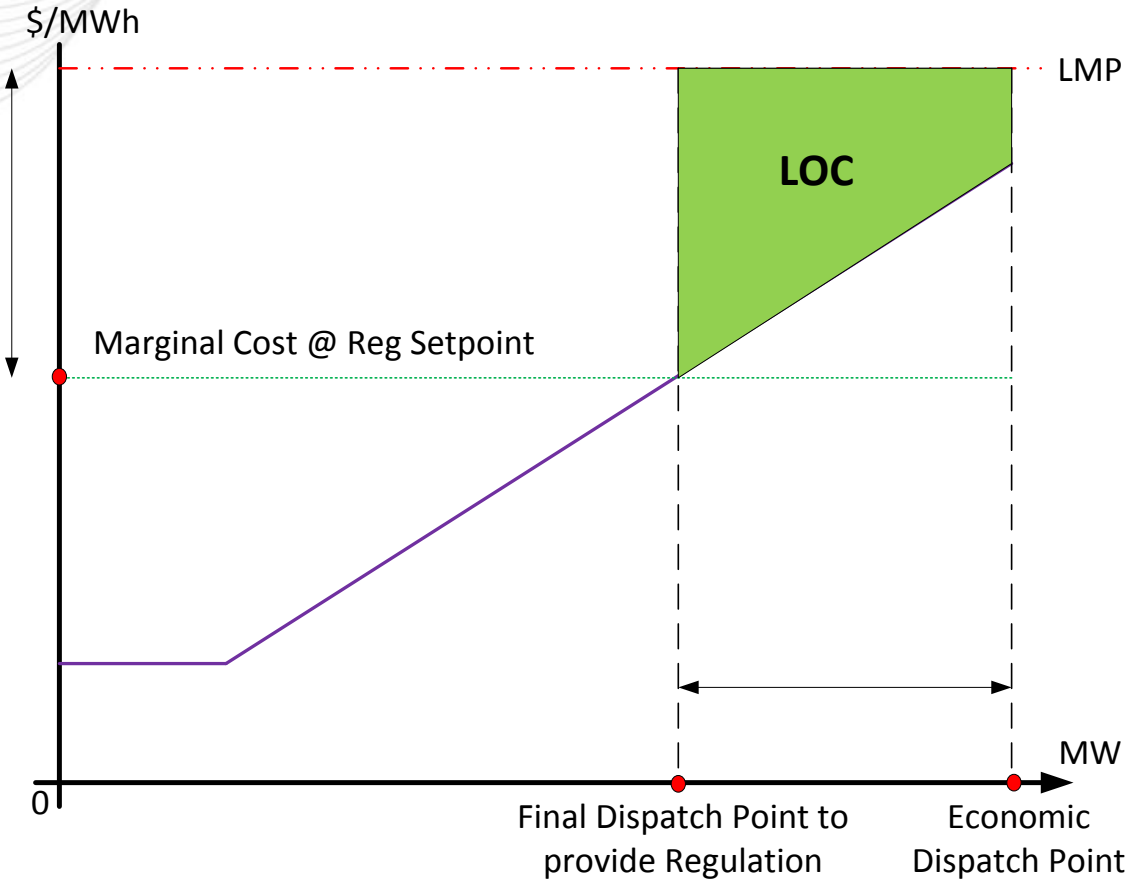
LMP – is the LMP at the resource bus;

MC – is the resource cost at the regulation set point;

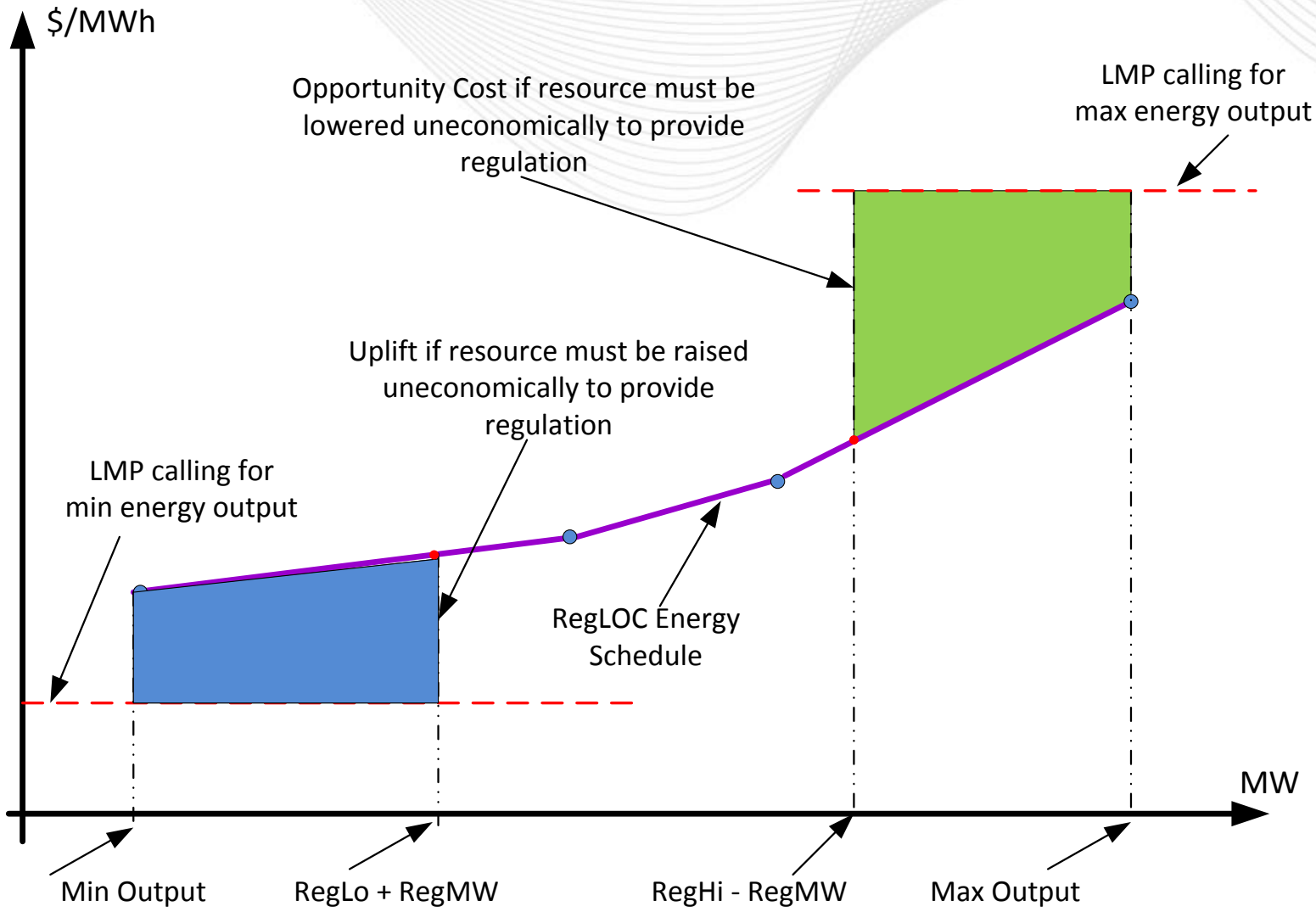
GENOFF – is the MW deviation from the economic dispatch and the regulation set point

Note:

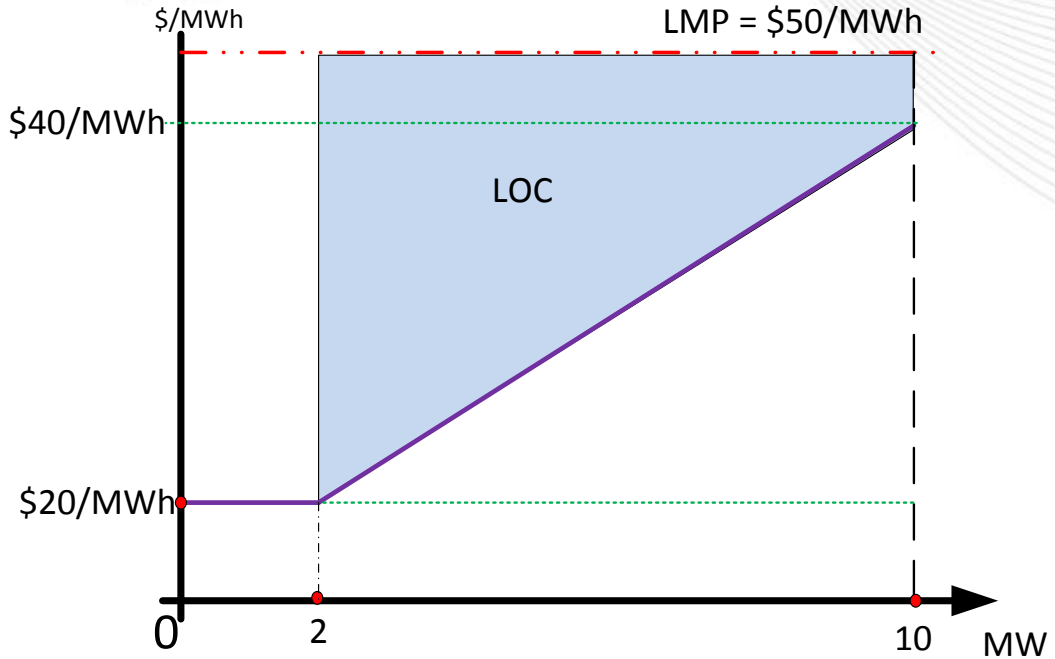
- In the clearing process, forecasted LMP is used
- In the pricing, Real-Time LMP is used
- RegLOC is further adjusted by:
  - Resource Historical Performance Score and
  - Resource Benefit Factor



Regulation Uplift and LOC



RegLOC Calculation and Benefit for Participating in Regulation Market



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

- 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