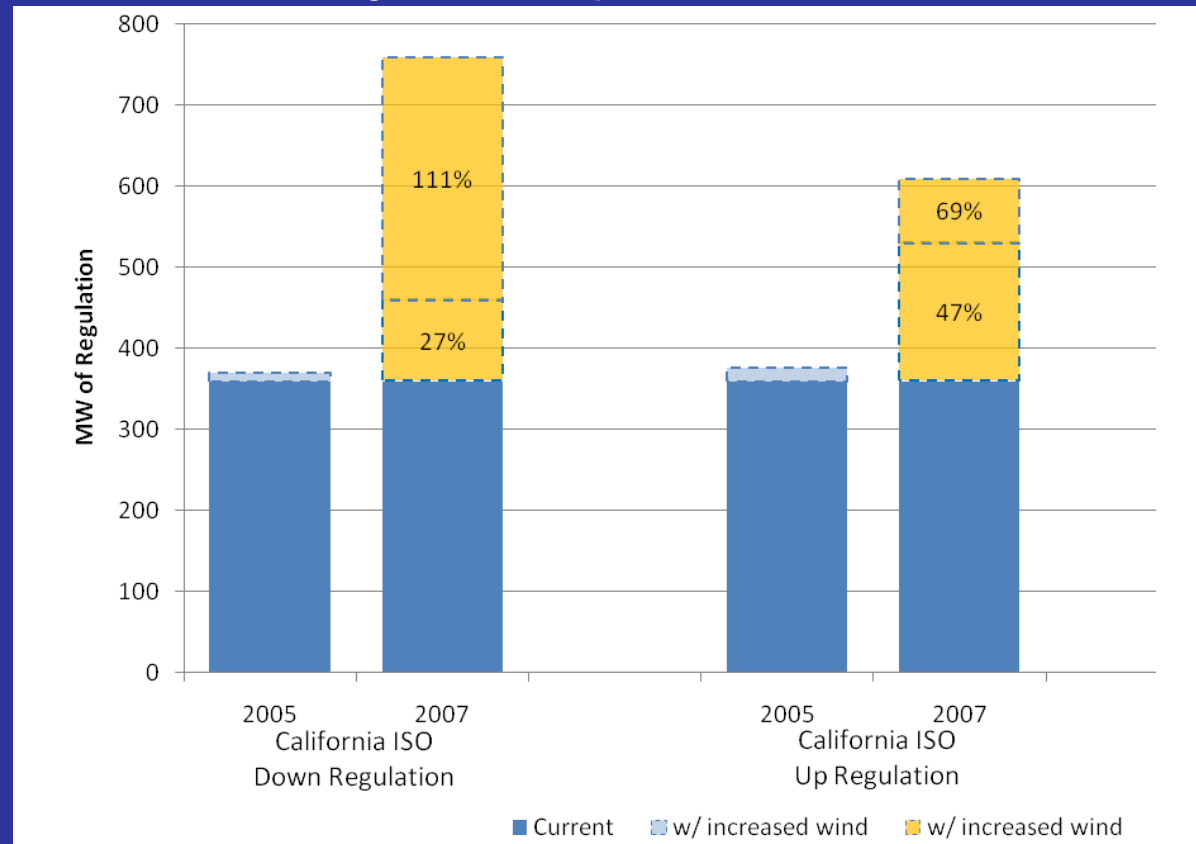


# Renewables Will Create Need for More Regulation Service



- RPS mandates increasing
- Increased wind penetration creates need for **greater regulation capacity** and **faster regulation ramping capability**
- Nov '07 CAISO report identified significant additional regulation requirements

Regulation Required with 10% Wind



*Advanced energy storage can meet this need*

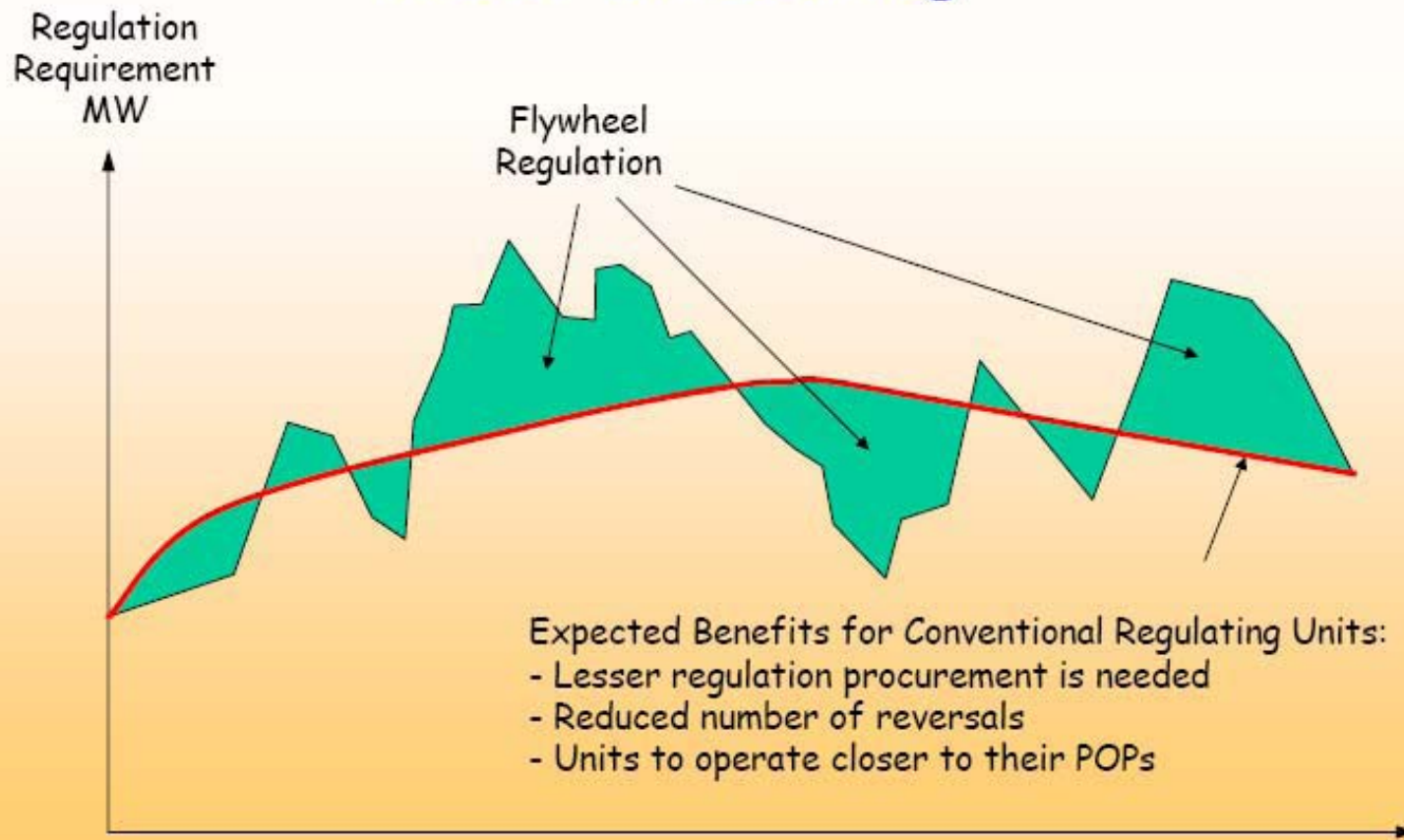
# CAISO Integration of Energy Storage



CALIFORNIA ISO

California Independent  
System Operator

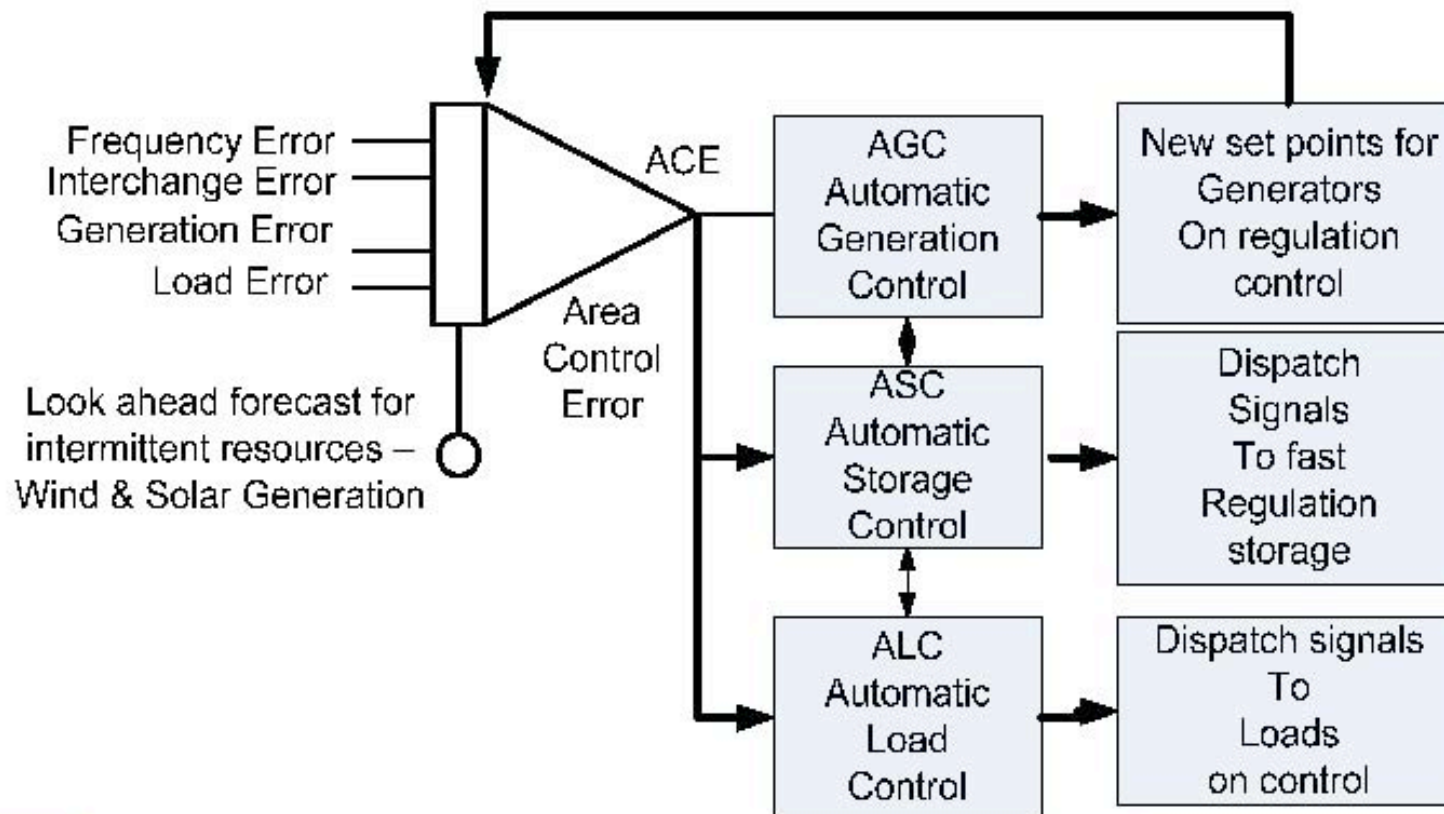
## ACE “Smoothing”



# CAISO Integration of Energy Storage



## Future Energy Management System Control System

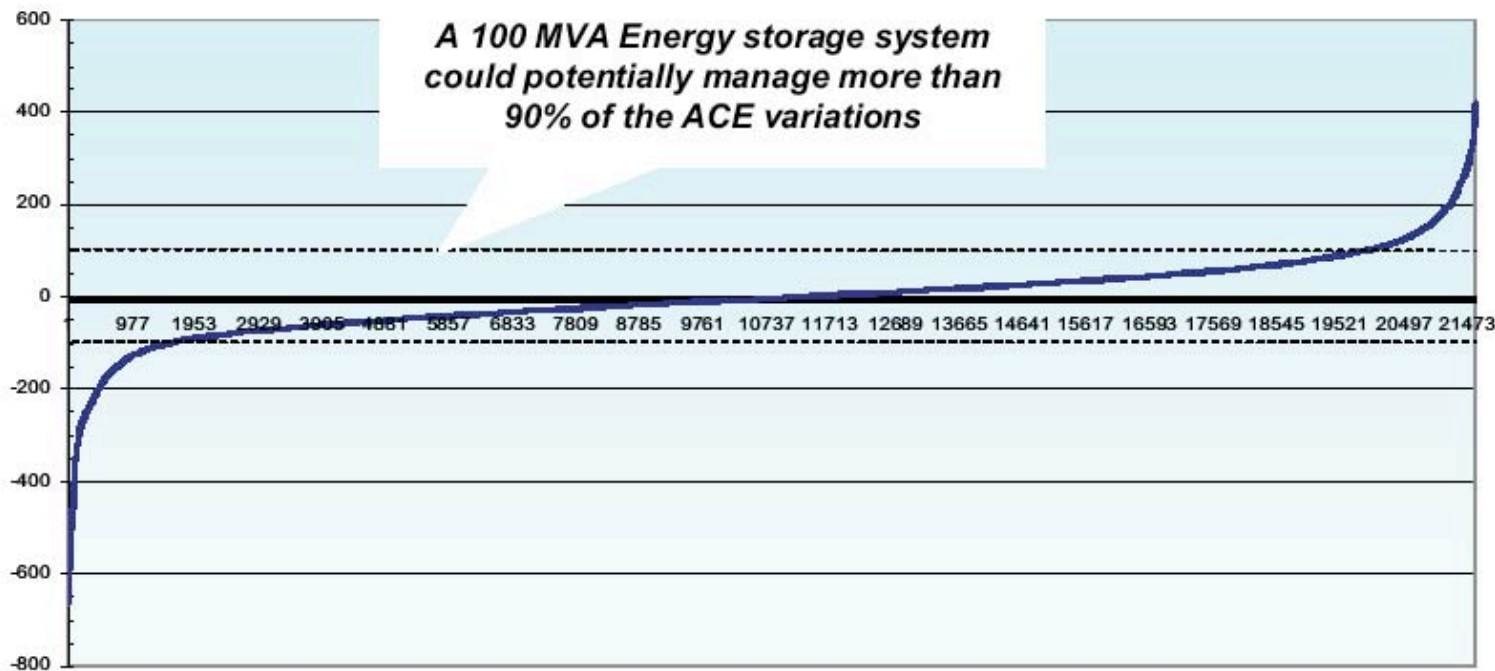


# CAISO Integration of Energy Storage



## Potential use of Energy Storage for ACE and Frequency Control

Variation of 4 Second ACE over a 24 hour Period sorted by MW value



# System Benefits of Energy Storage for Regulation Service



- Up to 100 times faster than incumbents
- Available separately – without generation
- Lowest operational cost
- Carbon emissions reduction
- Frees up generation capacity



# ISO-NE Alternative Technologies Regulation Pilot Program



- Pilot program scheduled to begin Nov 18, 2008
  - Duration approx. 18 months (or until permanent rules in place)
  - Pilot size: 13 MW total, 5 MW per participant
- System being built at Beacon headquarters in Tyngsboro, MA
  - 1<sup>st</sup> MW nearly ready
  - Operational by end of September
  - Build up to 5 MW

