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# Wind Generation Forecasting: A Balancing Authority View

David Hawkins  
Lead Industry Relations Representative

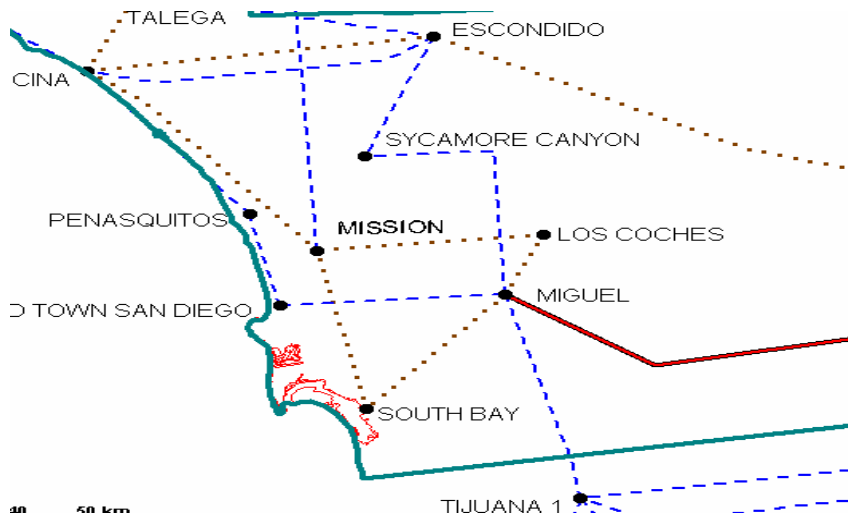
UWIG Meeting

Nov. 8, 2005

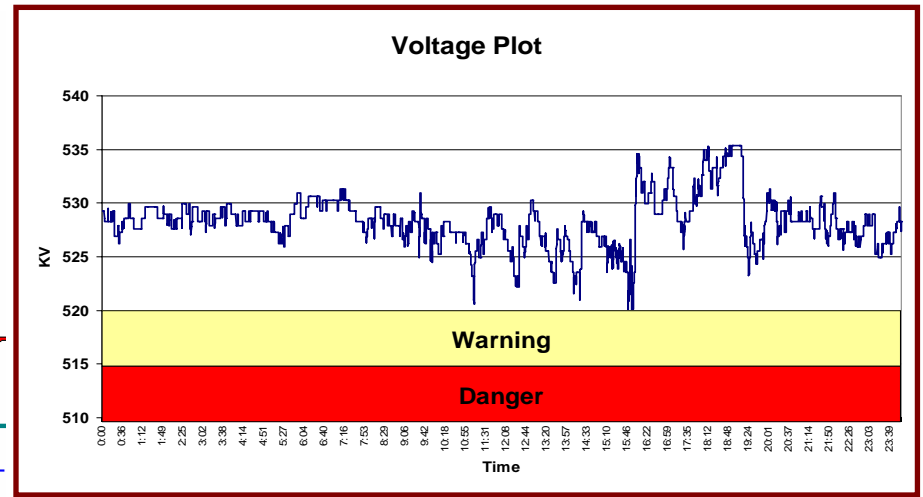


CALIFORNIA ISO

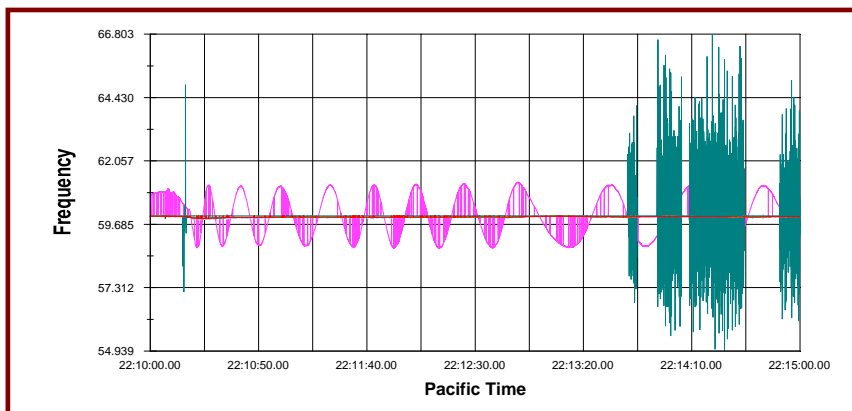
# Key Metrics for Balancing Authority Operators (Control Area Operators)



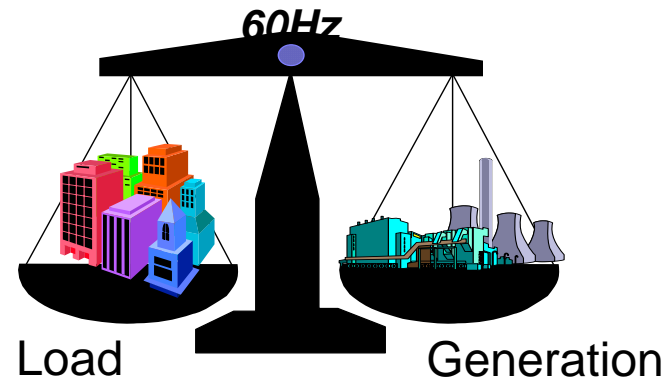
**Operate Transmission within Thermal Limits**



**Stay within Voltage Stability Limits**

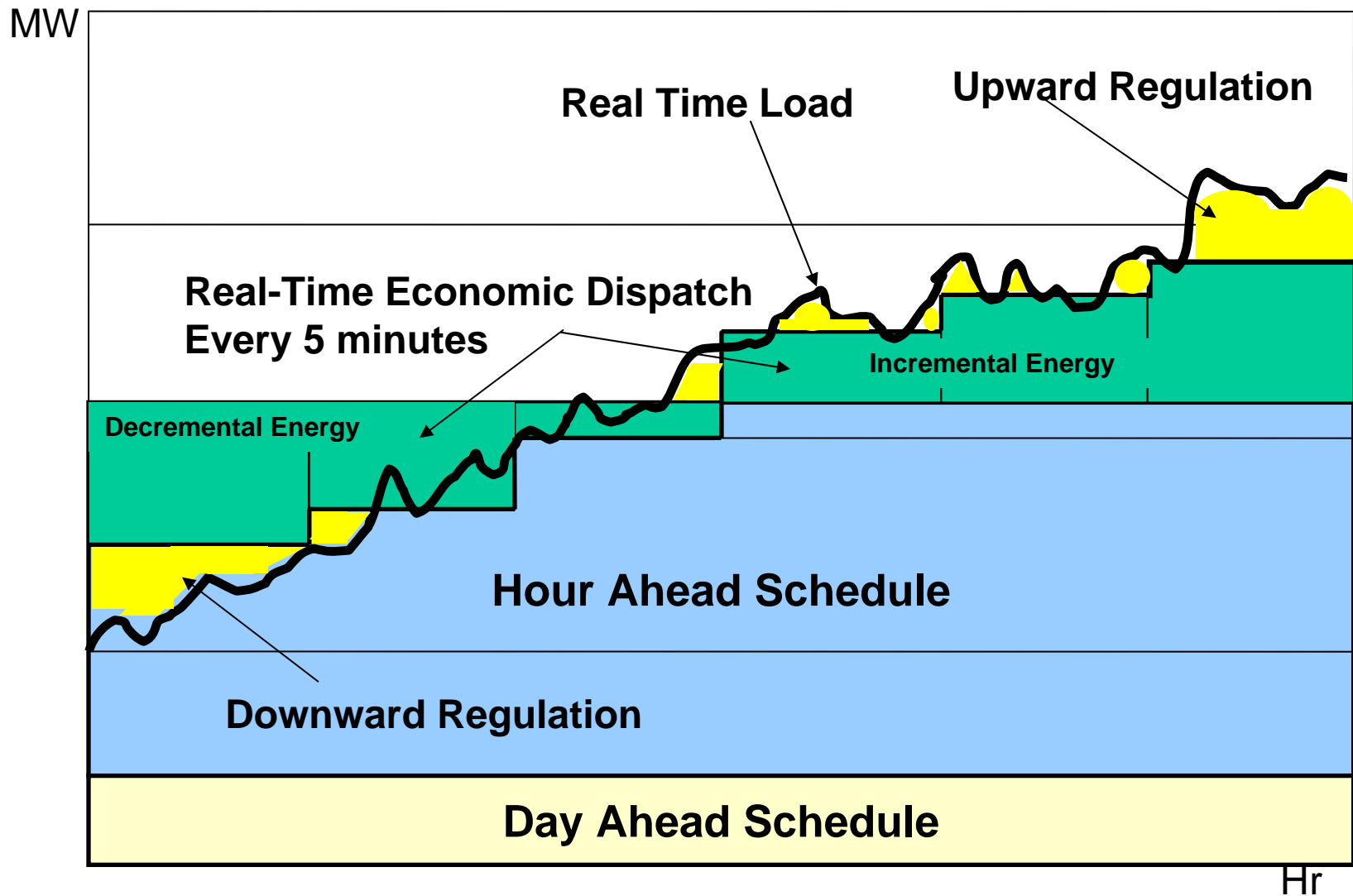


**Observe Transient Stability Limits**



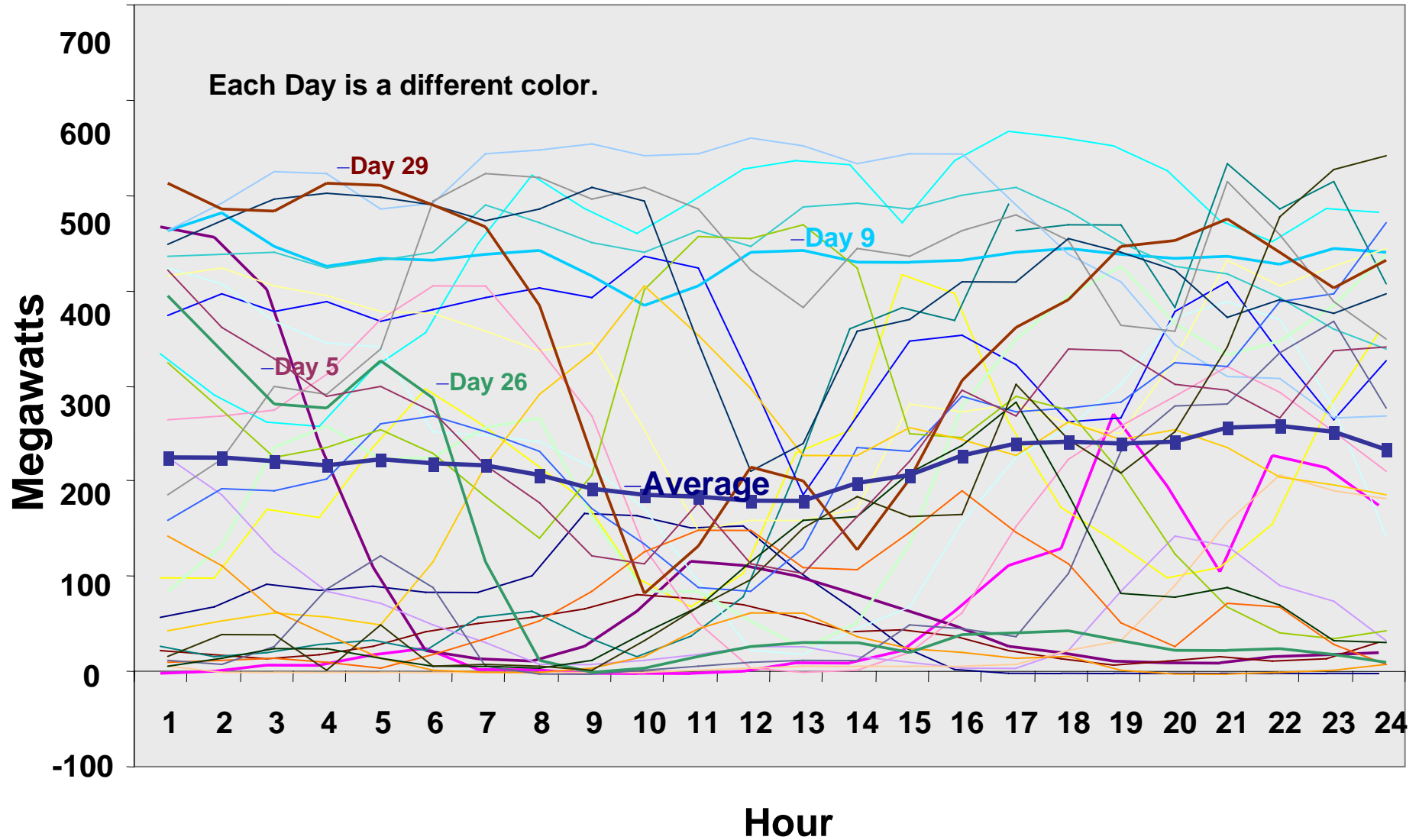
**Balance Load & Generation**

# Balancing Function - Area Control



# Wind Generation in April

Could you predict the energy production for this wind park either day-ahead or 5 hours in advance?



# Integration of Wind Generation

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## ➤ **Day Ahead Market**

- Need for accurate day-ahead wind generation forecasts for hourly energy production and anticipated hourly ramps
- Forecast Influences the procurement of Ancillary Services (Regulation and Operating Reserves) and accurate Day-Ahead Generation Dispatch notices for start-ups
- Assess impact of wind generation schedules on transmission congestion (source to sink)

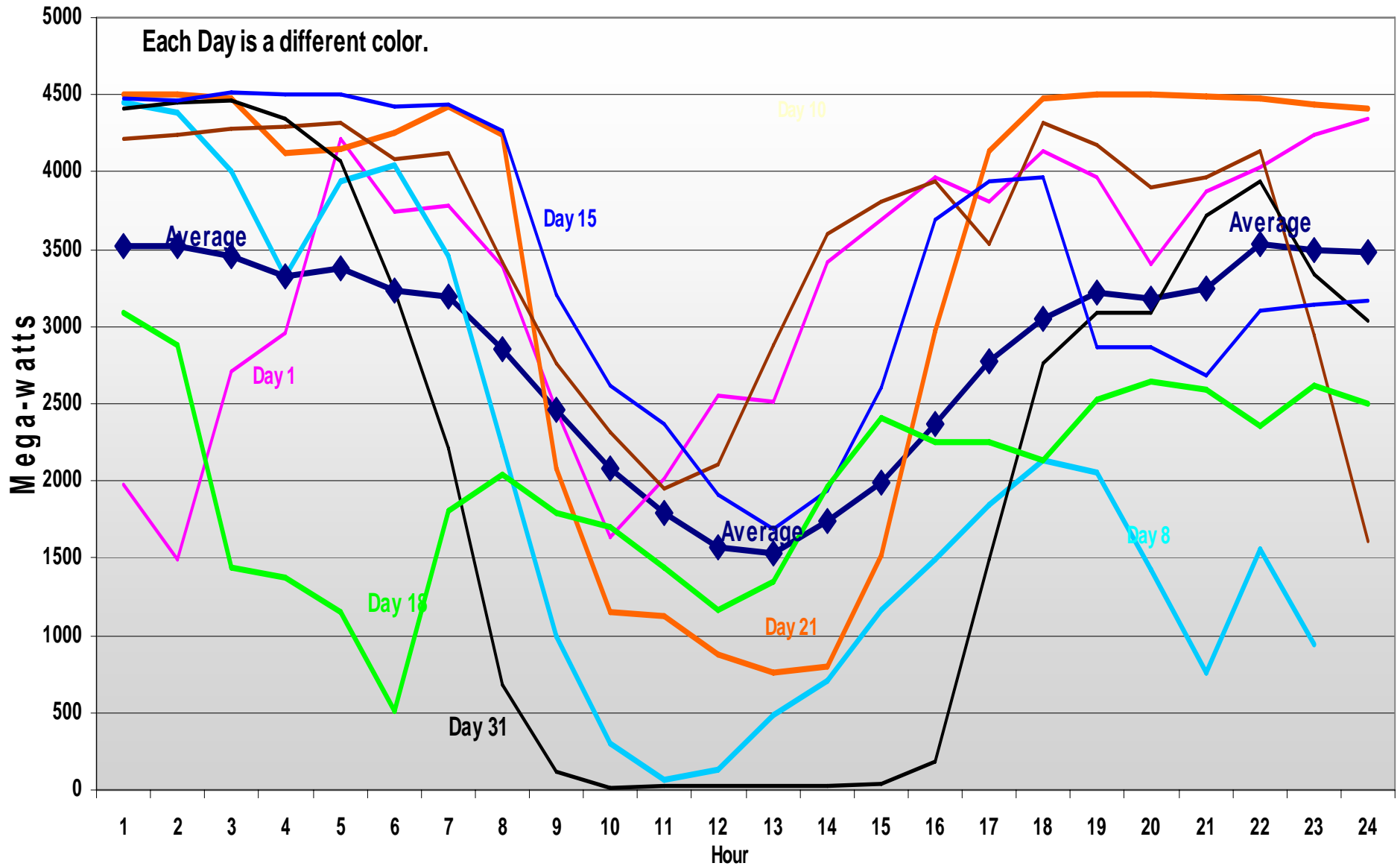
## ➤ **Real-time Operating Day and Operating Hour**

- Need for 5 hour ahead forecasts for accurate dispatch notices to quick start generators
- T-270 min Dispatch Notice to Short Start units
- T-75 min Hour Ahead market closes
  - All PIRP Wind Generation Schedules must be in

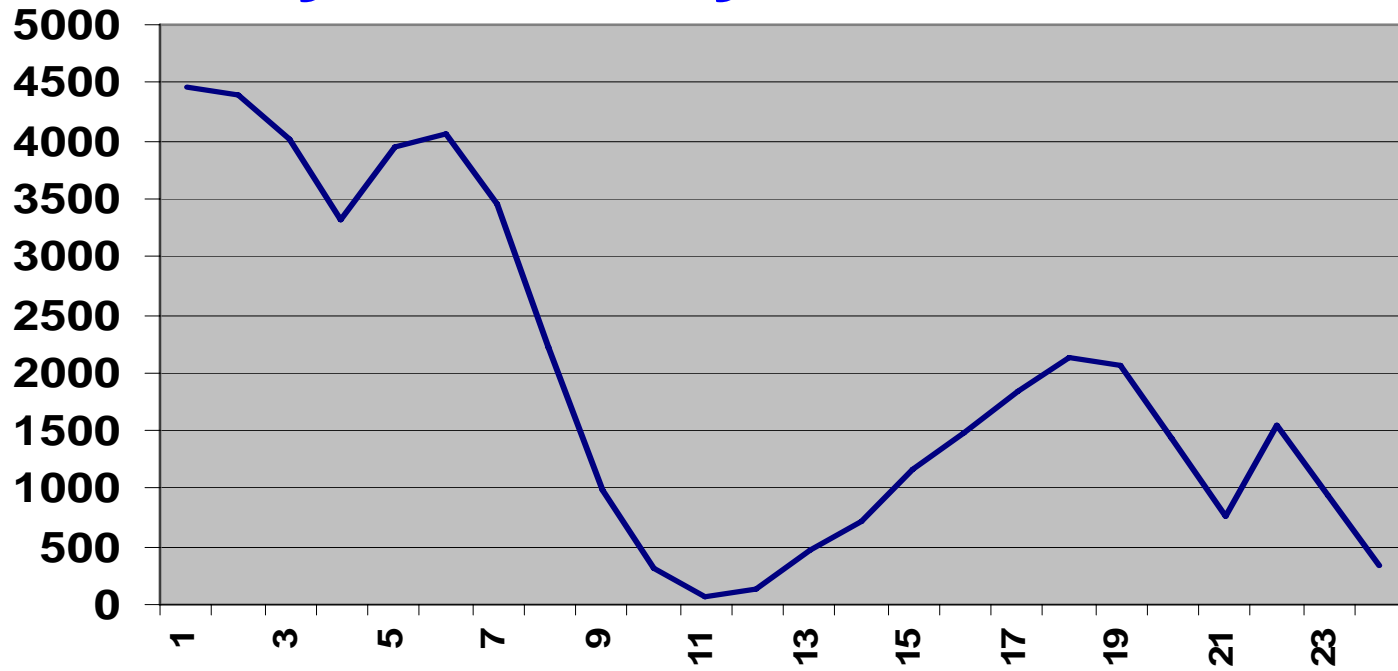


# Next Add 4000 MW on new Wind Generation Production

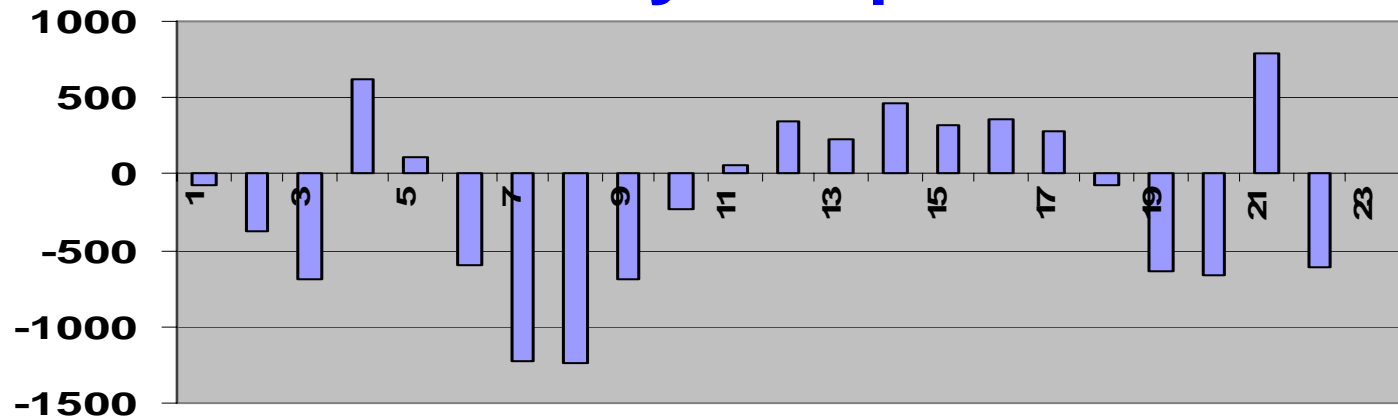
Total of 4600 MW of wind generation capacity



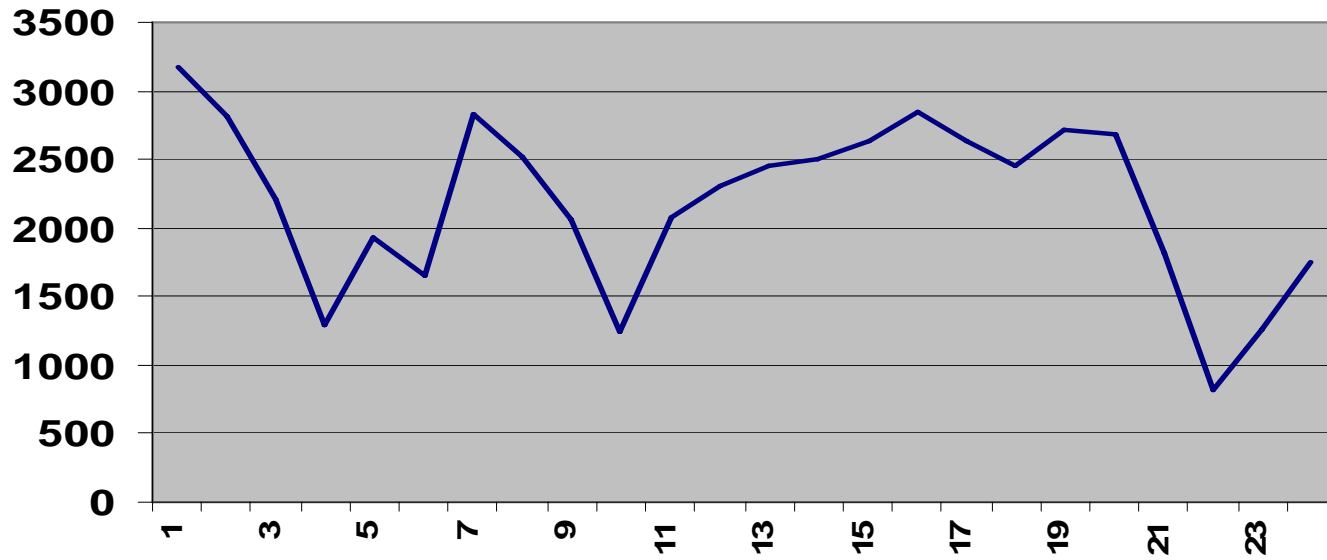
## Day 8 - Hourly Production



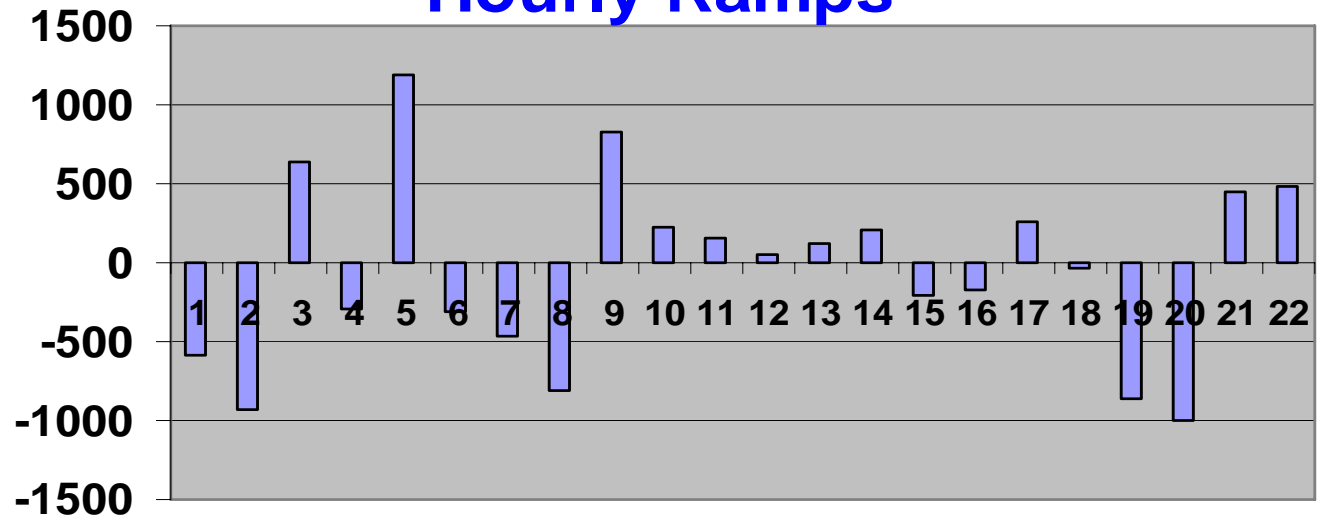
## Hourly Ramps



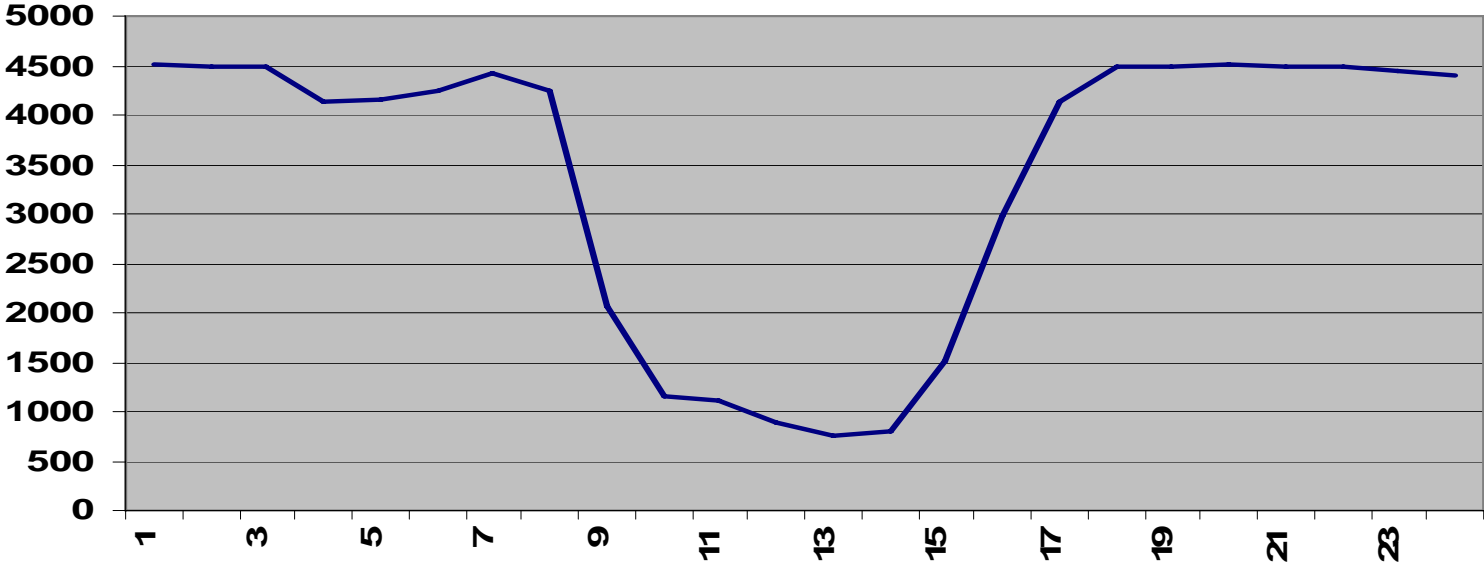
## Day 16 - Hourly Production



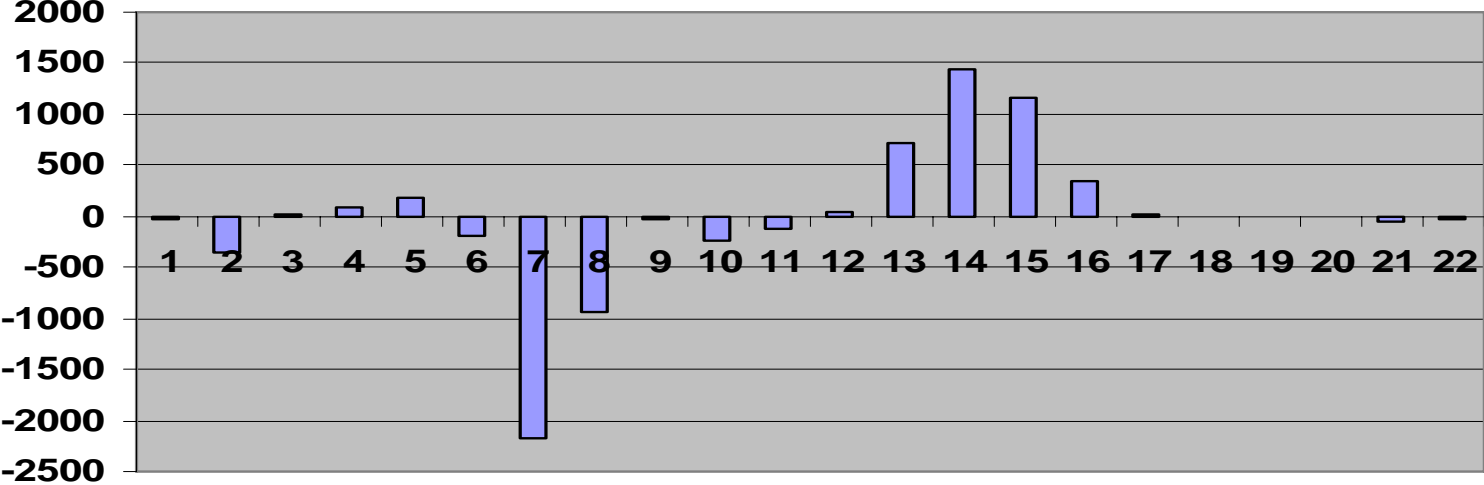
## Hourly Ramps



# Day 21 - Hourly Production



# Hourly Ramps



# Operational Issues

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- **Large Energy Ramps** -both Up and Down
- **Regulation Resources**
  - Major Impact on the amount of regulation up and down to be procured.
- **Supplemental Energy**
  - Major Impact on the amount of that must be dispatched per hour.
- **Day Ahead and Hour ahead forecasts**
  - Need accurate\_(5 & 2 hours in advance) forecasts and schedules for ALL Wind Generation Resources
  - Need accurate\_Day-Ahead forecasts\_for procurement of Operating Reserves and Regulation Resources and generator start-up dispatch notices & CRR



# Conclusions

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- We need to start testing new forecasting tools now to validate the models and methodologies.
- These new models will then be integrated into MRTU for 2007.
- California will need a portfolio of generating resources that can ramp fast, have short start up and shut down times, and have fast governor response for frequency control.
- The Regulation and Load Following burden to accommodate wind generation is not trivial but can be managed with good forecasting techniques and the right mixture of generation and load resources.

