Review of April Market Performance

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Performance of New ISO Markets – General Observations

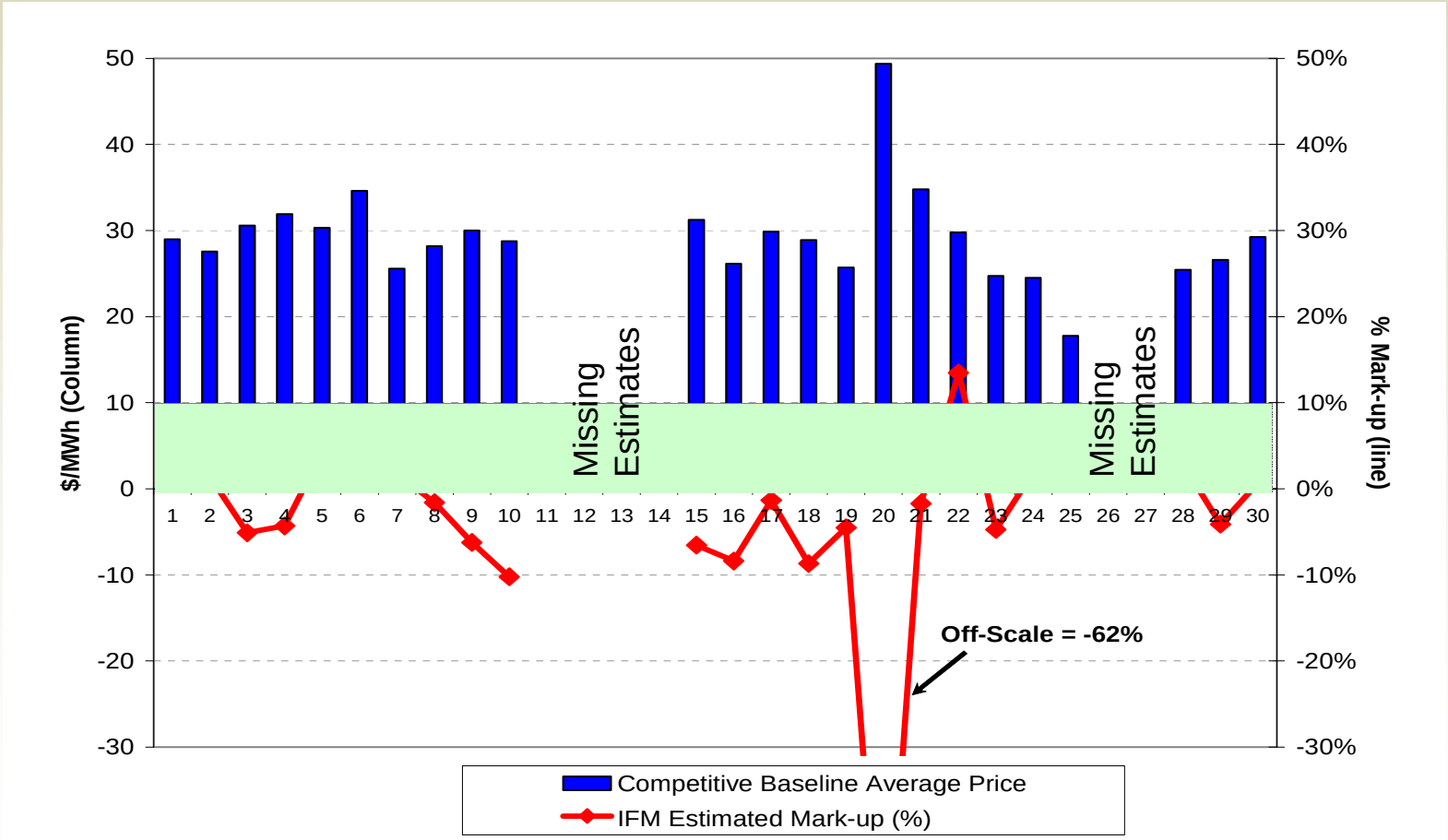
- New ISO markets are generally performing well:
  - Day ahead markets stable and competitive
  - Real Time markets competitive but volatile
  - Local Market Power Mitigation - working effectively
- Areas for improvement:
  - RTD price volatility
  - Price convergence (DA, HASP, RTD)
  - Exceptional Dispatch
  - CRR Revenue Adequacy
  - Price Transparency – Price Blocking

Periodic high real-time prices and lack of price convergence have been areas of particular focus for market monitoring.

- Degree and root causes of price divergence across markets
  - Day Ahead
  - Hour Ahead Scheduling Process (HASP)
  - Real Time Dispatch (RTD)
- High real-time prices during April heat wave (April 19-21)
  - Real-time Pre-Dispatch (RTPD)
    - Runs every 15-minutes
    - Includes HASP
    - Can commit fast-start resources
  - Real-time Dispatch (RTD)
    - 5-minute dispatch within the hour
    - Does not commit additional resources

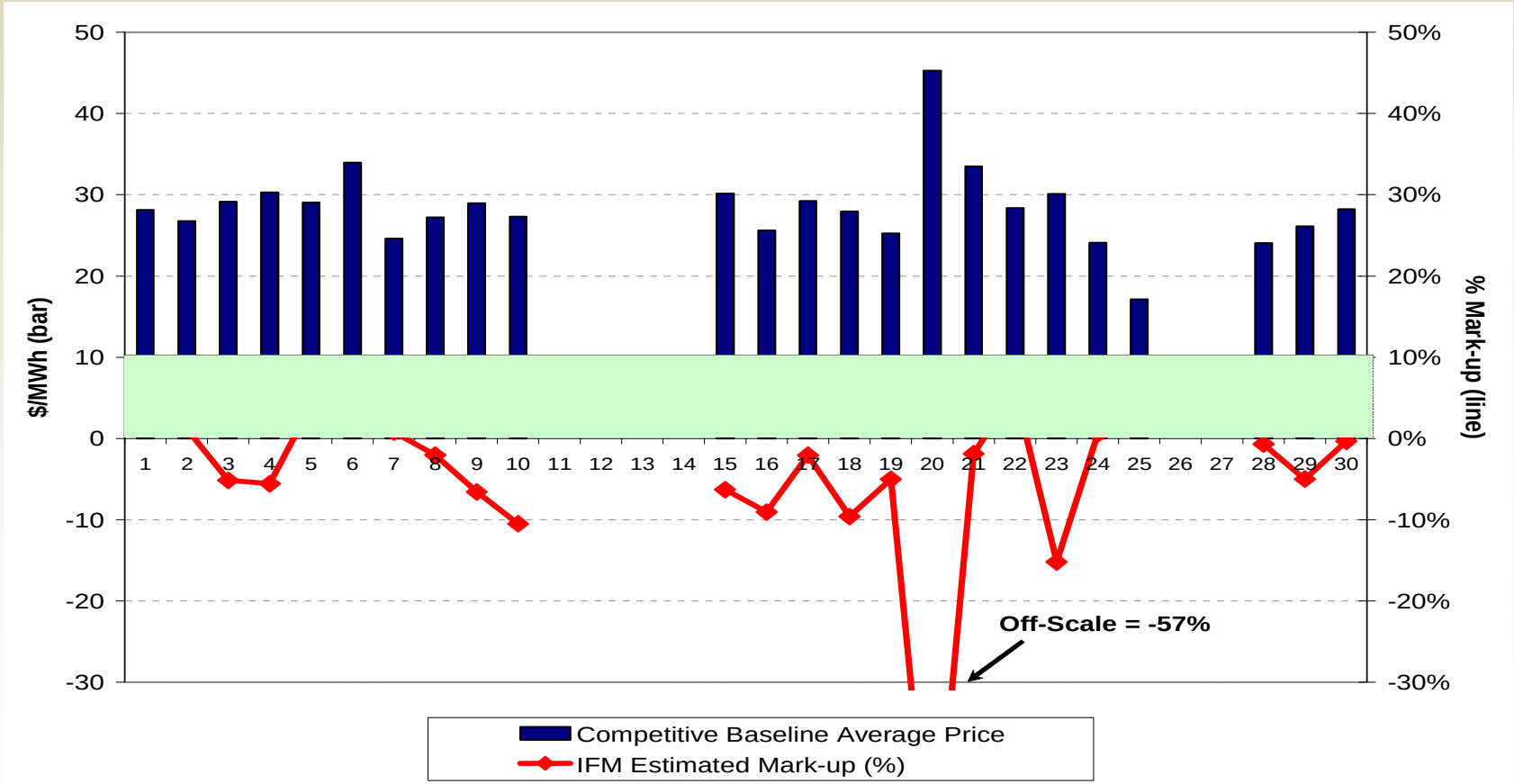
Day Ahead LAP prices for PG&E are very competitive.

- PG&E Average Daily LAP Prices – April 2009



Day Ahead LAP prices for SCE are very competitive.

- SCE Average Daily LAP Prices – April 2009



Overall average monthly LAP prices for April 2009 are within competitive ranges.

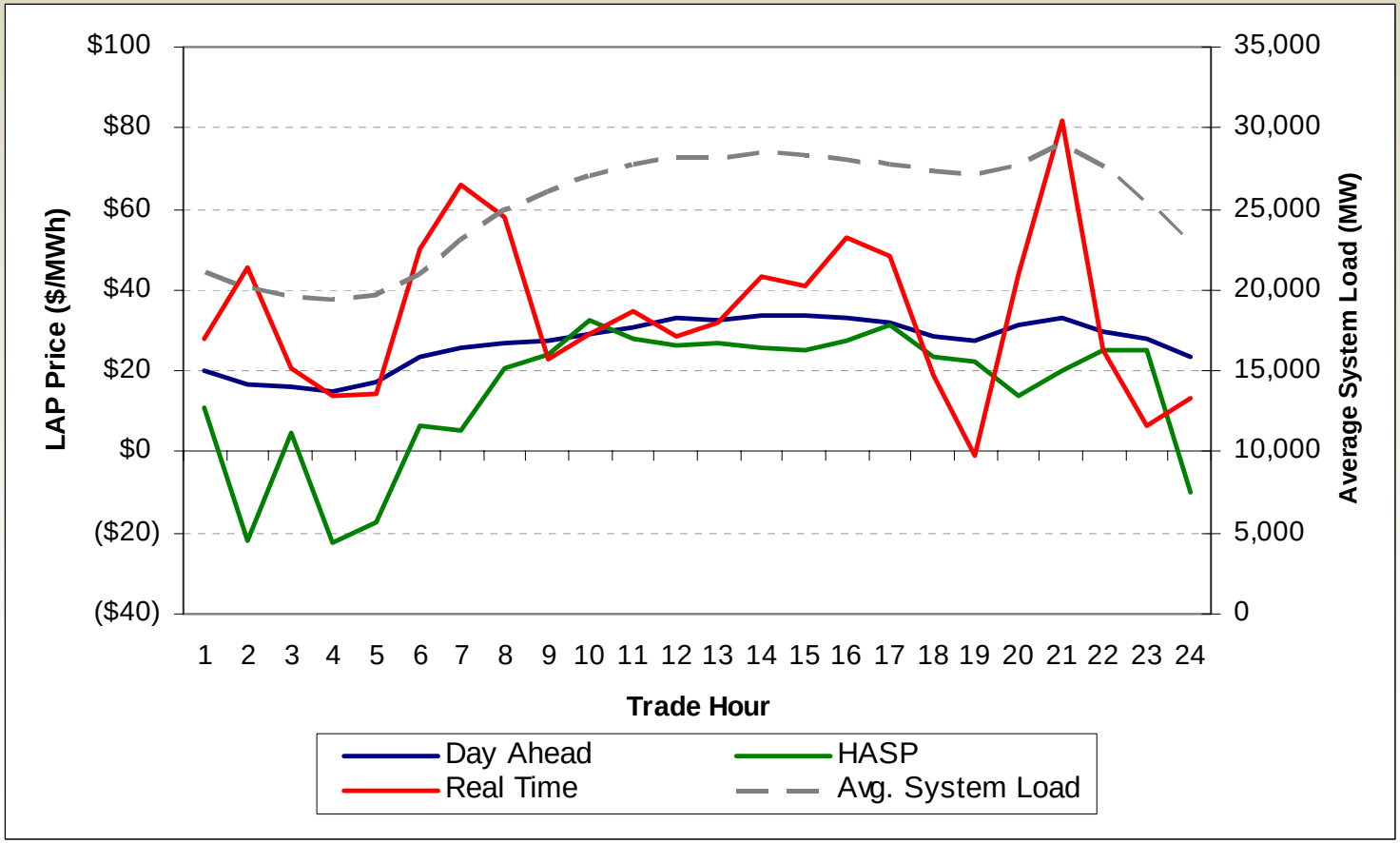
$/MWh	Weighted Average Cost - April 2009*			Monthly Mark-Up %	
LAP	Competitive Benchmark	IFM - Actuals	RTD - Actuals	IFM	RTD
PGAE	29.43	28.26	26.67	-4%	-10%
SCE	28.64	27.14	28.84	-6%	1%
SDGE	29.66	28.80	29.00	-3%	-2%

* Analysis excludes April 11-14 and April 26-27 due to simulation difficulties

** RTD Actuals exludes LAP prices greater than $500/MWh

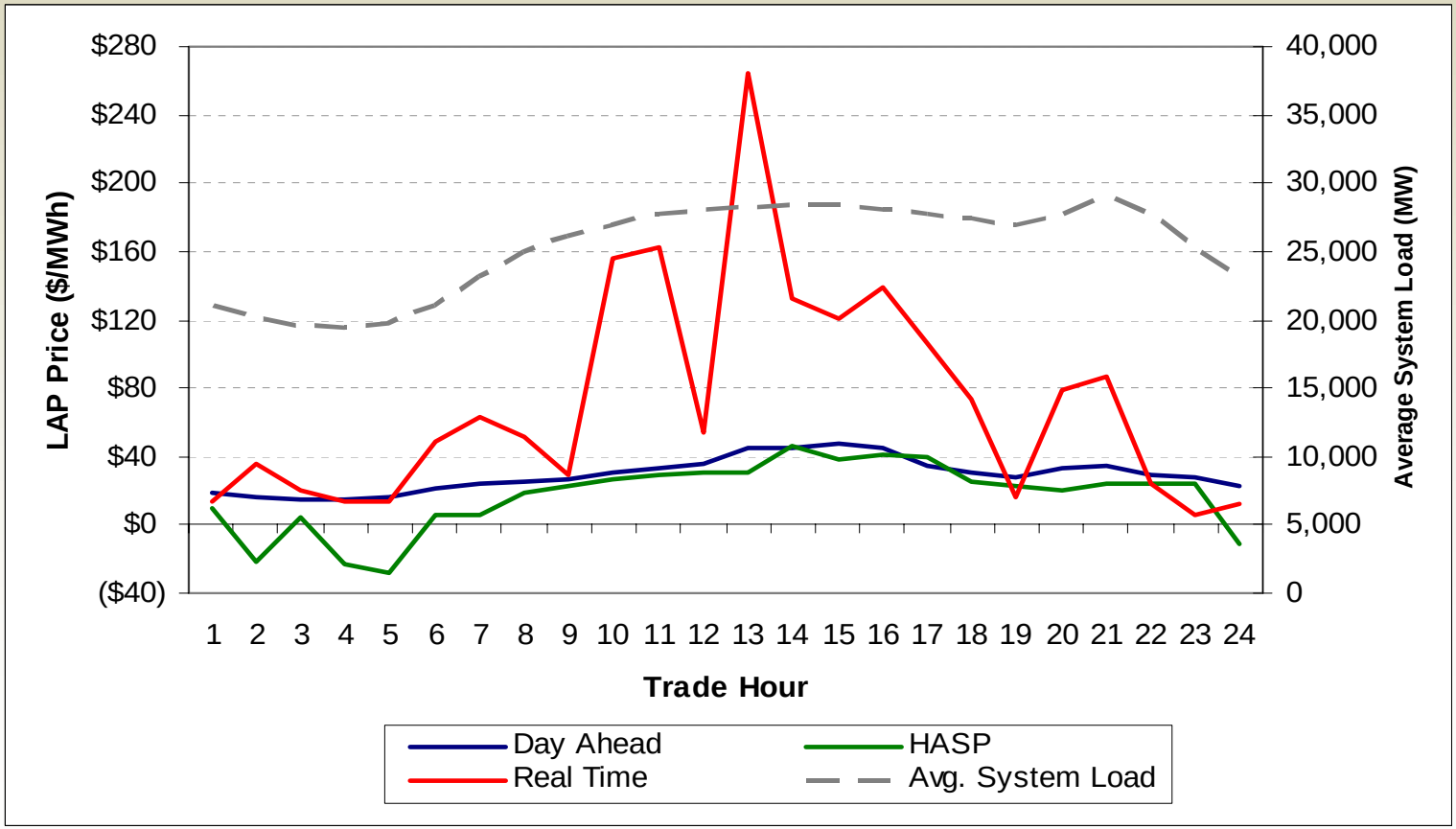
PG&E LAP prices show significant divergence across markets – particularly in morning hours.

- Comparison of PG&E LAP Prices – April Week Days



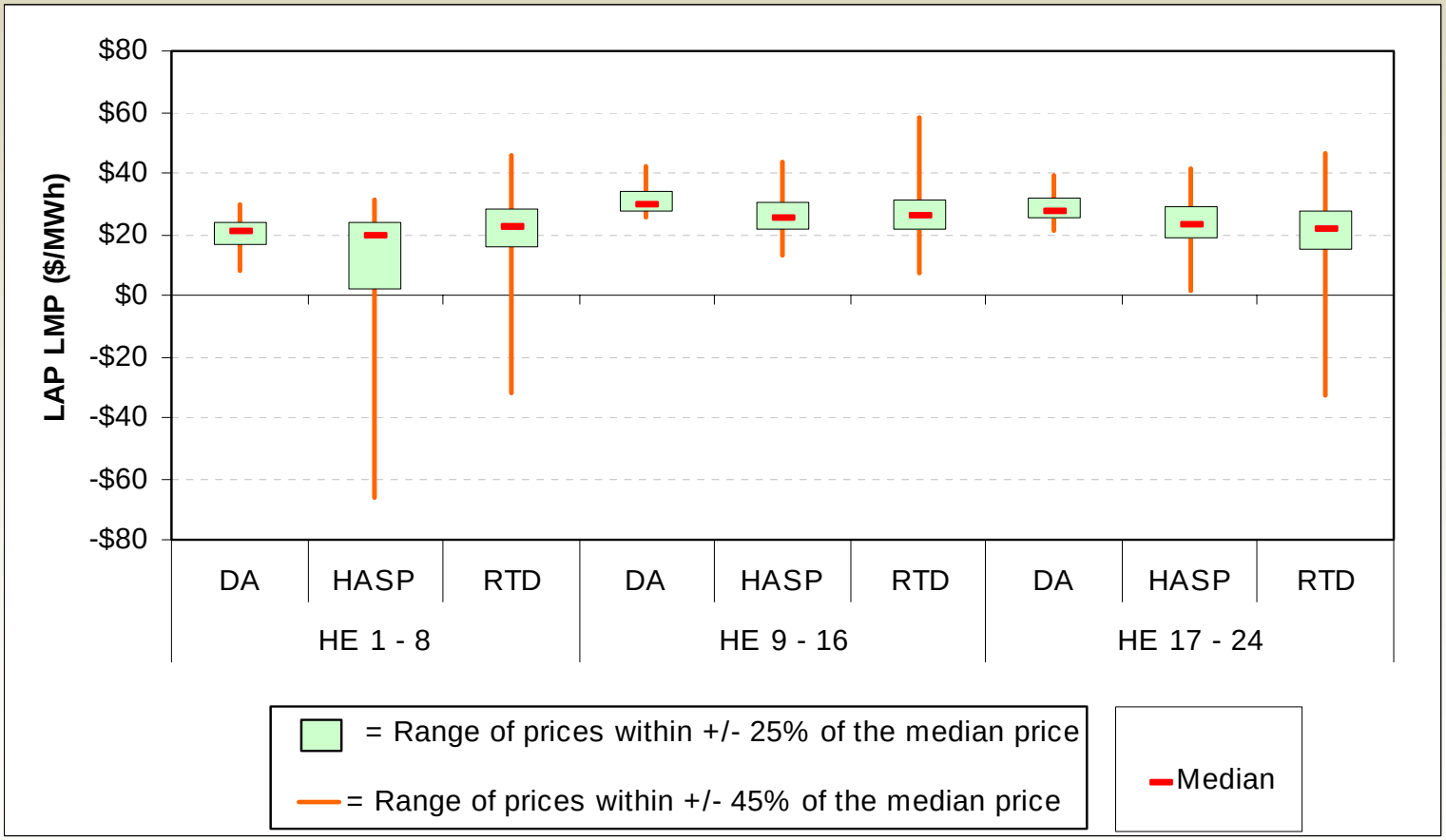
SDG&E LAP prices show significant divergence across markets – particularly in real time.

- Comparison of SDG&E LAP Prices – April Week Days



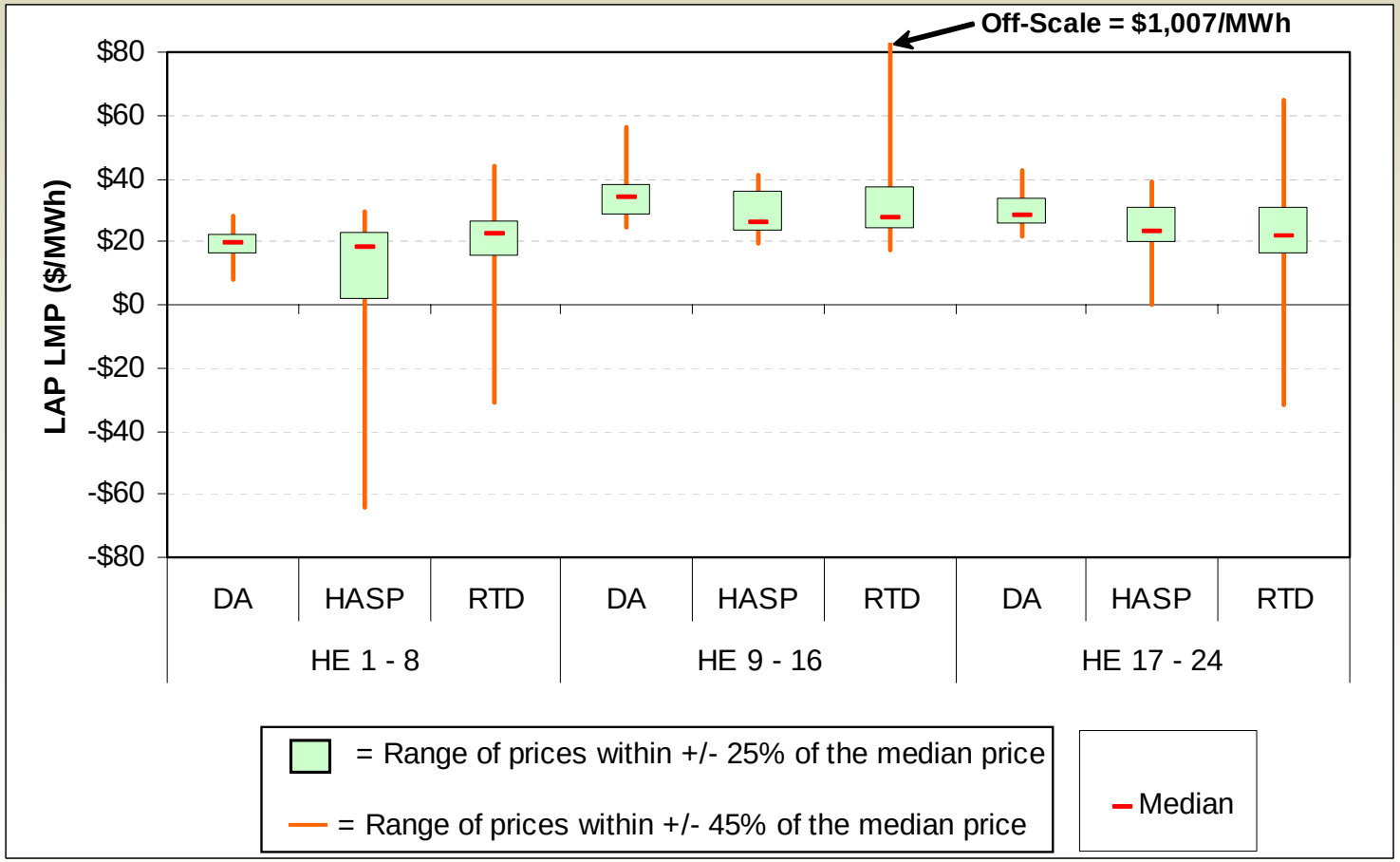
Review of Price Volatility – PG&E LAP

- Price Distribution – PG&E LAP Prices (April 2009)



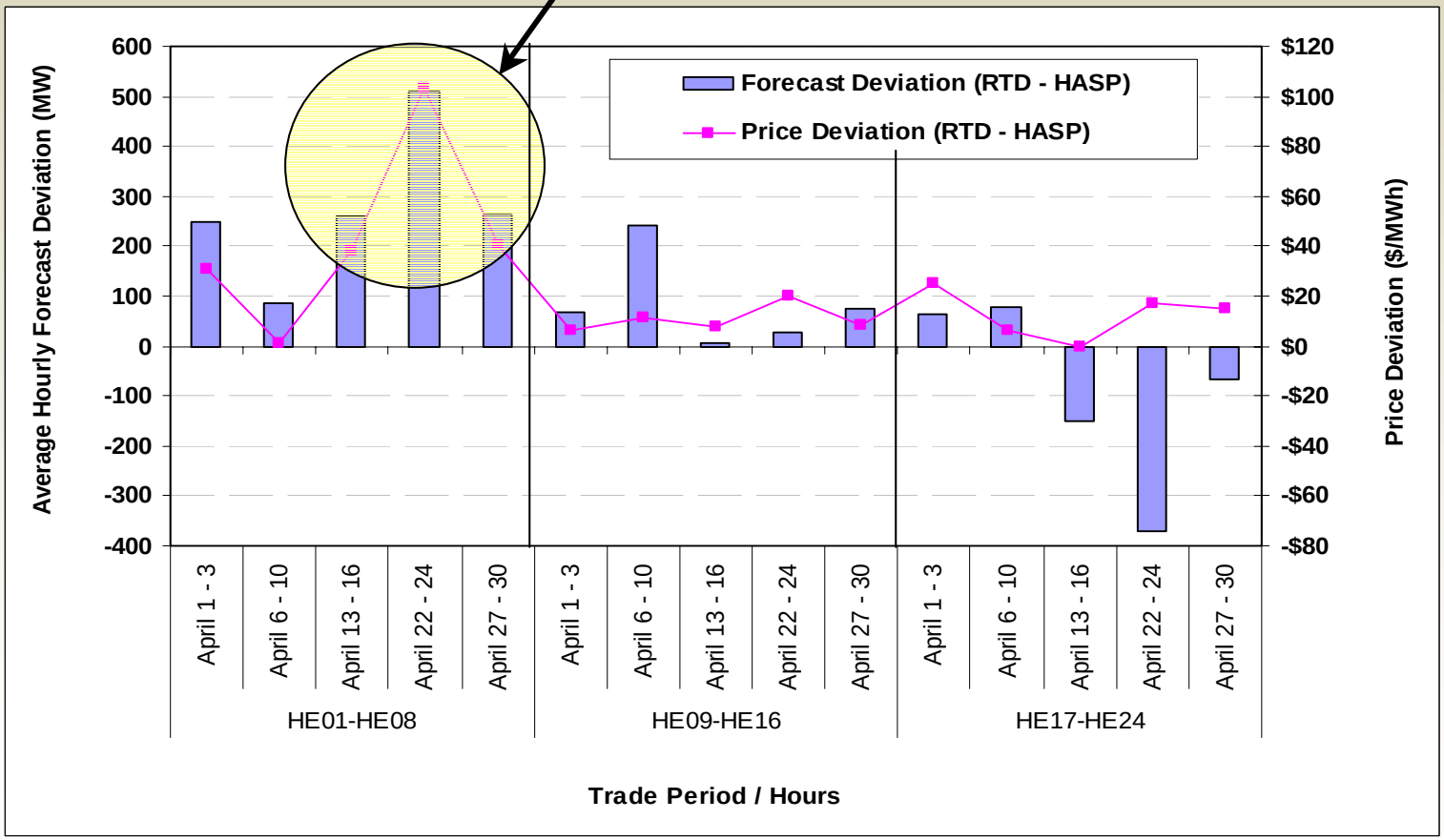
Review of Price Volatility – SDG&E LAP

- Price Distribution – SDG&E LAP Prices (April 2009)



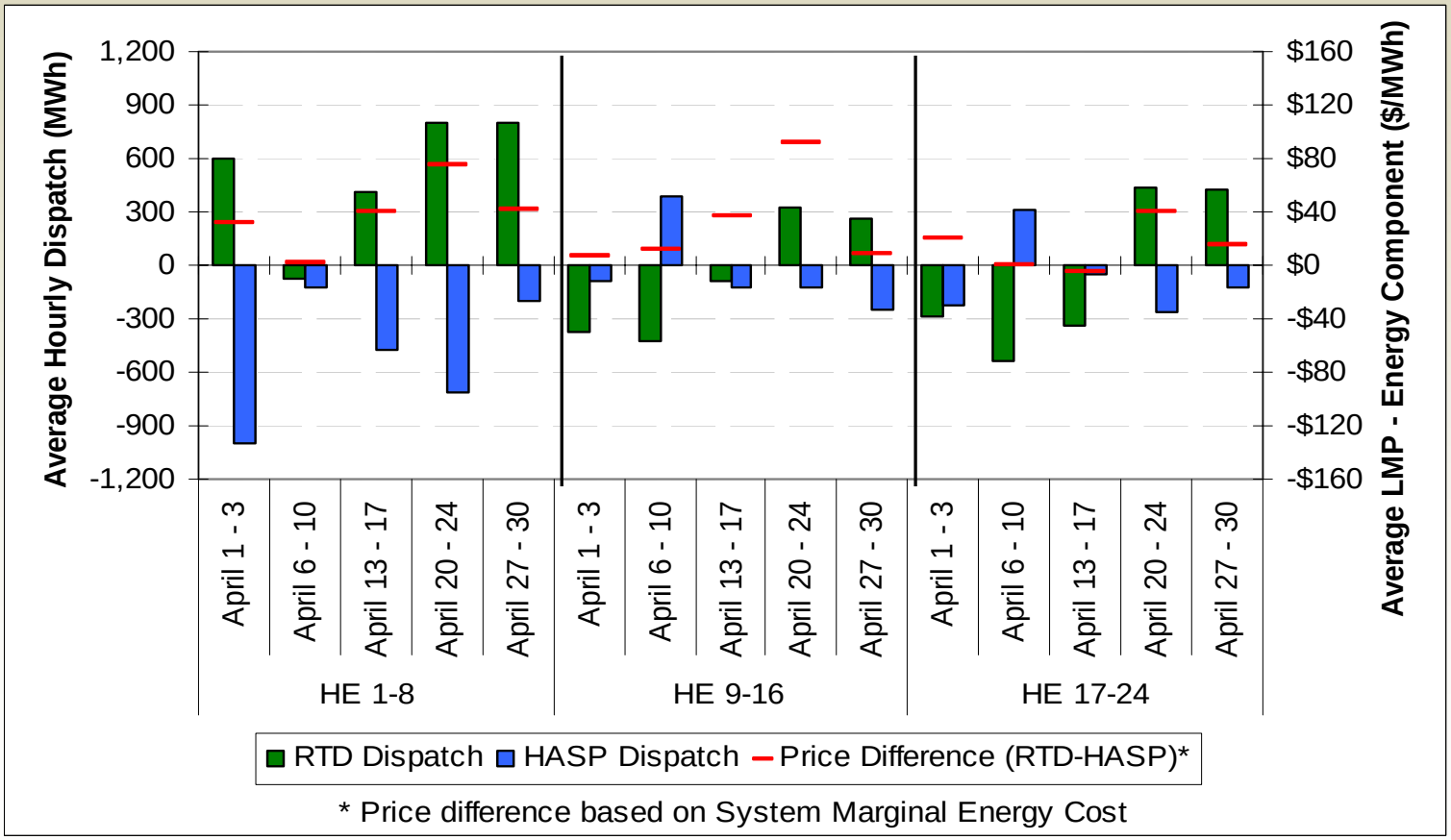
Load Forecast and Price Deviation between HASP and RTD

- April 2009 - Weekdays



HASP and RTD Dispatches are often in the opposite directions, which can result in significant market uplifts.

- April 2009 - Weekdays



April heat wave provided a good test of real-time market performance.

- Main drivers for higher San Diego prices (April 19-21)
  - Generation outages
  - De-rate in import capability
  - High loads
- Other potential drivers examined:
  1. Use of transmission biasing
  2. Inaccurate load forecasts
  3. Insufficient unit commitment of fast start resources
  4. Artificially low generation ramp rates
  5. Sub-optimal energy dispatch in RTD
  6. Non-compliance with energy dispatches
  7. Low generation availability

Analysis of April Heat Wave - Findings

Area of Investigation	Contributed to High Prices?
1. Import Limits & Biasing	**Yes**
2. Load Forecasts	**Yes**
3. Commitment of fast-start units	**Yes**
4. Low generator ramp rates	No
5. Sub-optimal RTD dispatch	No
6. Non-compliance with dispatch	No
7. Low generation availability	**Yes**

Analysis of April Heat Wave - Recommendations

- Improve accuracy of Real Time Market Load Forecasts
  - Better consistency between RTPD and RTD load forecasts and forecast biasing
  - More accurate Load Distribution Factors (LDFs)
- Use of transmission limit biasing –
  - Critical for reliable grid operation but
    - Can have significant market impacts
    - Should be used judiciously and closely monitored
    - Should be applied consistently in RTPD and RTD
- Generation availability –
  - Significant amount of San Diego capacity awarded Regulation and Contingency reserves – not available for normal market energy dispatch.
  - Should consider options for limiting A/S awards in these situations.

Analysis of April Heat Wave - Recommendations

- Pursue further refinements to the real time market optimization that would reduce extremely inefficient (but mathematically correct) dispatch
  - Parameter Tuning
  - Shift Factors