COVID-19 Impacts to California ISO Load & Markets:
March 17 – May 24, 2020

Market Analysis and Forecasting

May 27, 2020
Background

• Between March 17-19, various California counties started requiring non-essential businesses to close or limit activity, including restaurants and some commercial stores, and directed companies to have their employees work from home if possible.

• On March 20, the state ordered all individuals living in California to stay home except for critical infrastructure sectors, and to get essential goods and services.

• On May 9, the state launched its Pandemic Roadmap, which allowed for counties to submit plans for phased reopening of businesses, schools, and public spaces. The majority of California counties have applied for gradual and modified re-openings.
Summary

• Since the first full week of the statewide stay-at-home order, the ISO has observed:
  
  ➢ **Weekday** average load reductions of 4.2%, and up to 7.4% reductions during peak hours.

  ➢ hourly average load reductions range from 0.5% to 12%, with the highest percent reductions observed during HE 7 through HE 18

  ➢ **Weekend** average load reductions of 1.4%, and up to 3.2% reductions during peak hours.

• Because ISO’s forecasting process allows us to perform a backcast analysis given the underlying weather conditions and type of day, these reductions compare actual load to expected loads if no order were in place.

• While the sophisticated load forecast models could not have anticipated the stay-at-home order, the ISO continues to fine-tune its models to improve forecast accuracy in day-ahead and real-time markets as conditions evolve.

• Energy prices have declined by about $10/MWh in the day-ahead and real-time markets.

• There have been no impacts to grid reliability from the stay-at-home order.
Partial Stay-at-Home
(March 17-19)

Weekday: 2.7-5.8%
Weekend: 0-1%

Full Stay-at-Home
(March 23 – May 10)

Weekday: 4.5-7.4%
Weekend: 1.3-3.8%

Note: Largest reductions occur over the morning peak and mid-day hours.
Removing weather errors to isolate stay-at-home order’s impact

Backcast Analysis
Methodology for removing weather errors to isolate stay-at-home order’s impact

- CAISO is using a backcast model, which removes the largest known sources of weather error to isolate the stay-at-home order’s impact.
- The difference between the expected load model and what actually occurred is referred to as model error.
  - COVID-19 is a component of model error. There is a normal range for model errors and what is seen in this analysis is outside the normal range, allowing the ability to isolate the COVID-19 Impact.
Weather Adjusted: System impact March 9 - March 19

![Graph showing system impact from March 9 to March 19 with data points for expected and actual power generation.](image)
Weather Adjusted: System impact March 20 - March 29
Weather Adjusted: System impact March 30 – April 12
Weather Adjusted: System impact April 13 – April 26
Above-normal temperatures were experienced system-wide May 4 – 10. During the heat, minimal to no load reductions were observed for the evening peak, compared to pre-COVID-19 orders.

The ISO continues to see the most significant reductions to load during the morning and mid-day hours.
The ISO continues to observe that during days with warmer temperatures, minimal to no load reductions were observed for the evening peak, compared to pre-COVID-19 orders.

During the month of May, the ISO continues to see the most significant percent reductions to load during the morning and mid-day hours.
Summary of system impact: March 23 – May 24

<table>
<thead>
<tr>
<th>Day Type</th>
<th>Peak</th>
<th>MW Impact</th>
<th>MW Percent Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td>Morning</td>
<td>1,862</td>
<td>7.4%</td>
</tr>
<tr>
<td>Weekday</td>
<td>Evening</td>
<td>1,298</td>
<td>5.3%</td>
</tr>
<tr>
<td>Weekend</td>
<td>Morning</td>
<td>662</td>
<td>3.2%</td>
</tr>
<tr>
<td>Weekend</td>
<td>Evening</td>
<td>184</td>
<td>0.8%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Day Type</th>
<th>MWhs Impact</th>
<th>MWhs Percent Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td>23,816</td>
<td>4.2%</td>
</tr>
<tr>
<td>Weekend</td>
<td>7,150</td>
<td>1.4%</td>
</tr>
</tbody>
</table>

Numbers Show an Overall Reduction

The stay-at-home order began on Friday, March 20; our summary begins at the first full week beginning Monday, March 23. For details of impact during the partial stay-at-home orders, see slide 14.
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Average weekday hourly percent difference in expected load due to COVID-19

The stay-at-home order began on Friday, March 20; our analysis begins at the first full week beginning Monday, March 23.
Market analysis and forecasting

Price impact: COVID-19
Energy prices trended downward in the first two weeks of the shelter-in-place provisions.
Day-ahead energy prices reduced on average about $10/MWh in the period of the shelter-in-place provisions.
Fifteen-minute energy prices reduced on average about $10/MWh in the period of the shelter-in-place provisions.