Slice of Day Resource Counting Workshop
Recap and Modeled Results from 2007-2020 Weather Year Data

August 23, 2022 RA Reform Implementation Workshop (R. 21-10-002)

NP Energy on behalf of the Natural Resources Defense Council

NP ENERGY

Disclaimer: This presentation is offered for policy development and discussion purposes only. Formal positions offered by NRDC within the proceeding may evolve through the stakeholder process.

Presentation Overview

Today's presentation is primarily intended to provide regional solar and wind results under the exceedance and worst day methodologies using observed weather and modeled resource performance for weather years 2007-2020.

Insights and Takeaways

Assigning resources hourly profiles consistent with their expected output during worst day conditions will improve the durability and reliability of the RA framework.

➢ **_Correlation Matters:_** Resource profiles must reflect the variability of system conditions (e.g. load, net load, supply margin), not only the variability of the underlying resource (e.g. exceedance)

➢ **_Regional profiles Matter:_** Disaggregating to regional profiles for wind will better align investment signals for out-of-state and offshore wind profiles complementary to California's resource mix

➢ **_Calibrating Exceedance is Difficult:_** Identifying a single exceedance value that results in representative shapes and magnitudes for all hours within a month and all months within a year is both impractical and unnecessary

Collaboration for Today's Presentation

Today's presentation leverages west-wide resource of the GridPath RA Data Toolkit[1]:

➢ Data reflect modeled resource and load performance using historical weather data calibrated to observed resource performance where available

➢ Developed by Blue Marble Analytics and Moment Energy Insights with support from GridLab

➢ Full results and data available upon request:
  ➢ Slice of Day Analysis Questions: Nick@NPEnergyCA.com
  ➢ GridPath RA Toolkit Questions:
    ➢ Priya@GridLab.org
    ➢ Elaine@MomentEnergyInsights.com
    ➢ Ana@BlueMarble.run

Recap: Methodologies

Exceedance, Peak Day, Worst Day

Recap – Exceedance, Peak Day, Worst Day

- **Exceedance –** indicates the output of a resource (% nameplate) on at least X% of observations (e.g. 70%) for each month-hour pair

- **Peak Day –** Exceedance calibration method using observed or modeled performance on grid stress days (e.g. highest load days)

- **Worst Day –** Resource profile derived directly from observed or modeled performance on grid stress days (e.g. highest load days)

Exceedance Basics

Solar Exceedance (August, 70%, Illustrative)
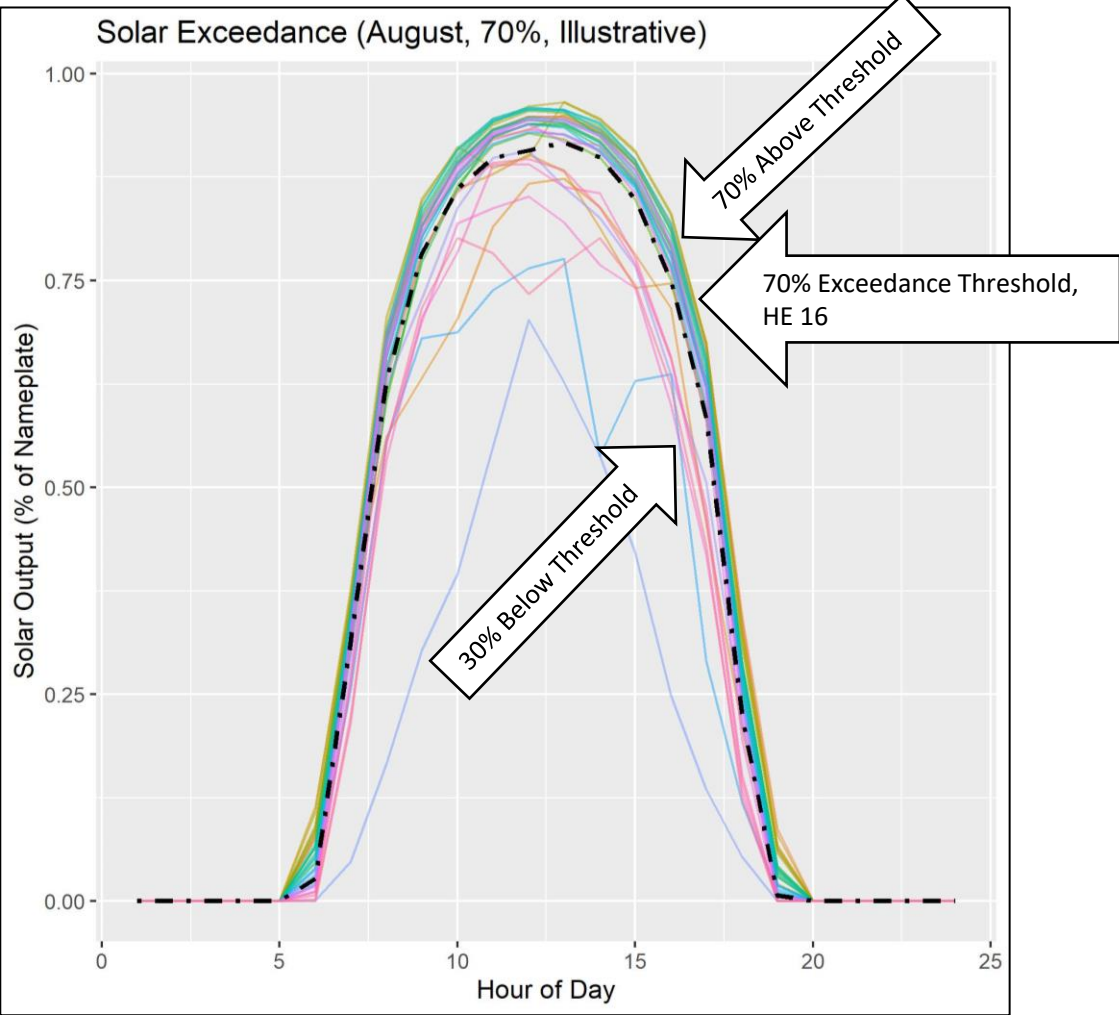
Exceedance indicates the level of output (%, MW) of a resource that can be expected a specific percentage of time (e.g. 70%):

➢ **Data Needs:** Exceedance analysis can be performed on any data set:
  ➢ Historical or modeled datasets may be used
  ➢ Larger datasets will produce more robust results, but marginal value declines after ~2-3 years of data
  ➢ Modeled data must be aligned with real-world weather distributions, incl. growing risk of extreme weather

➢ **Correlation with Reliability:** Exceedance does not inherently consider correlation effects between resource performance and outage risk. Calibration efforts are intended to align exceedance with reasonably expected output during grid stress conditions.

Peak Day Exceedance Calibration

Peak Day Profile Overlaid on Exceedance Profiles

Parameter
— S_Exc_50
— S_Exc_60
— S_Exc_70
— S_Exc_75
— S_Exc_80
— S_Exc_90
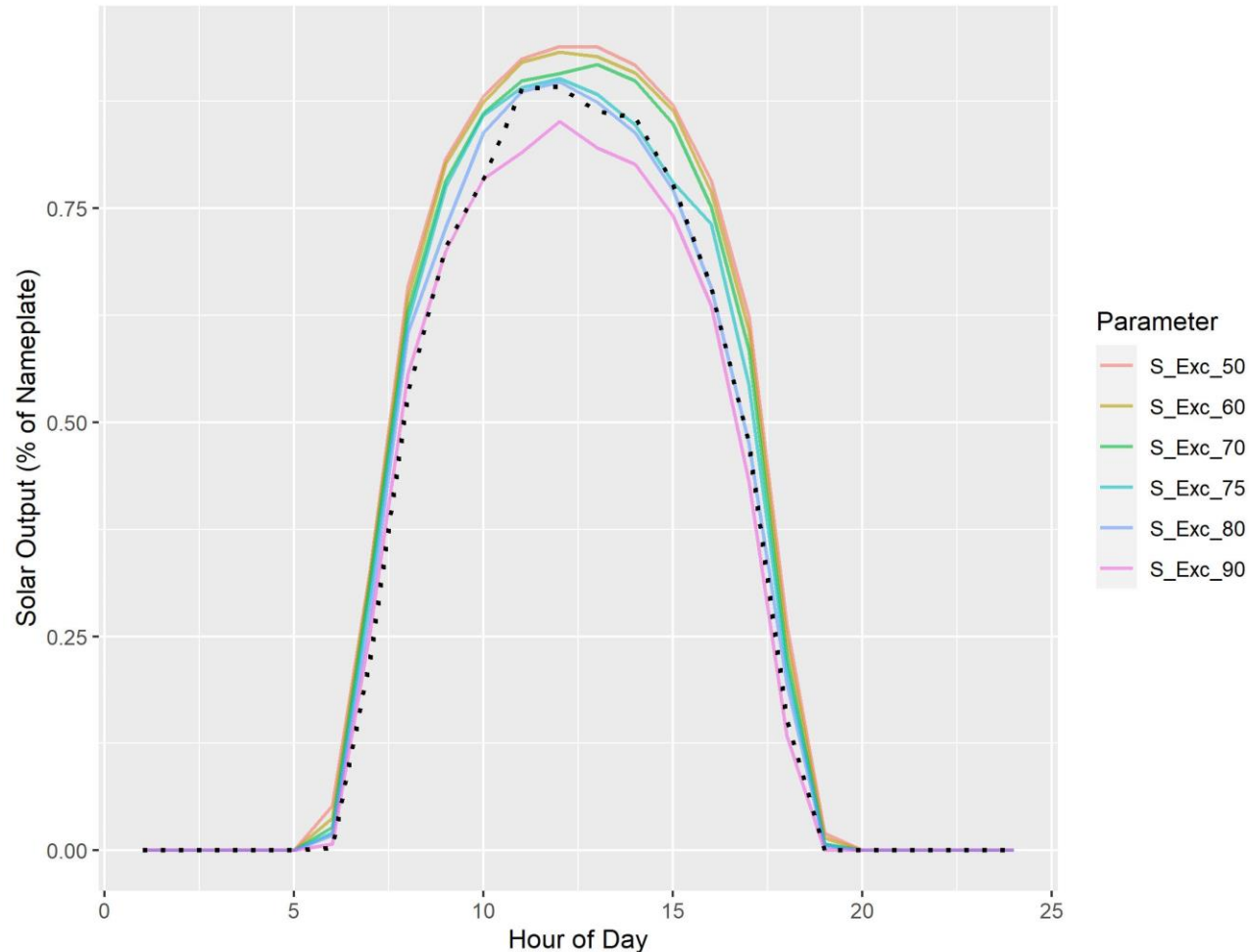
The Peak Day Exceedance methodology selects an exceedance parameter based on its alignment with historical peak day resource performance.

➢ D.22-06-035 directed the use of PG&E's proposed "Peak Day" methodology to calibrate the exceedance parameters

➢ The Peak Day Exceedance methodology develops a nexus between resource performance and reliability risk.

Peak Day Exceedance is an intuitive method for calibrating exceedance profiles; however, Peak Day profiles may not align well with exceedance profile shapes.

Worst Day Methodology

Worst Day Methodology (August)
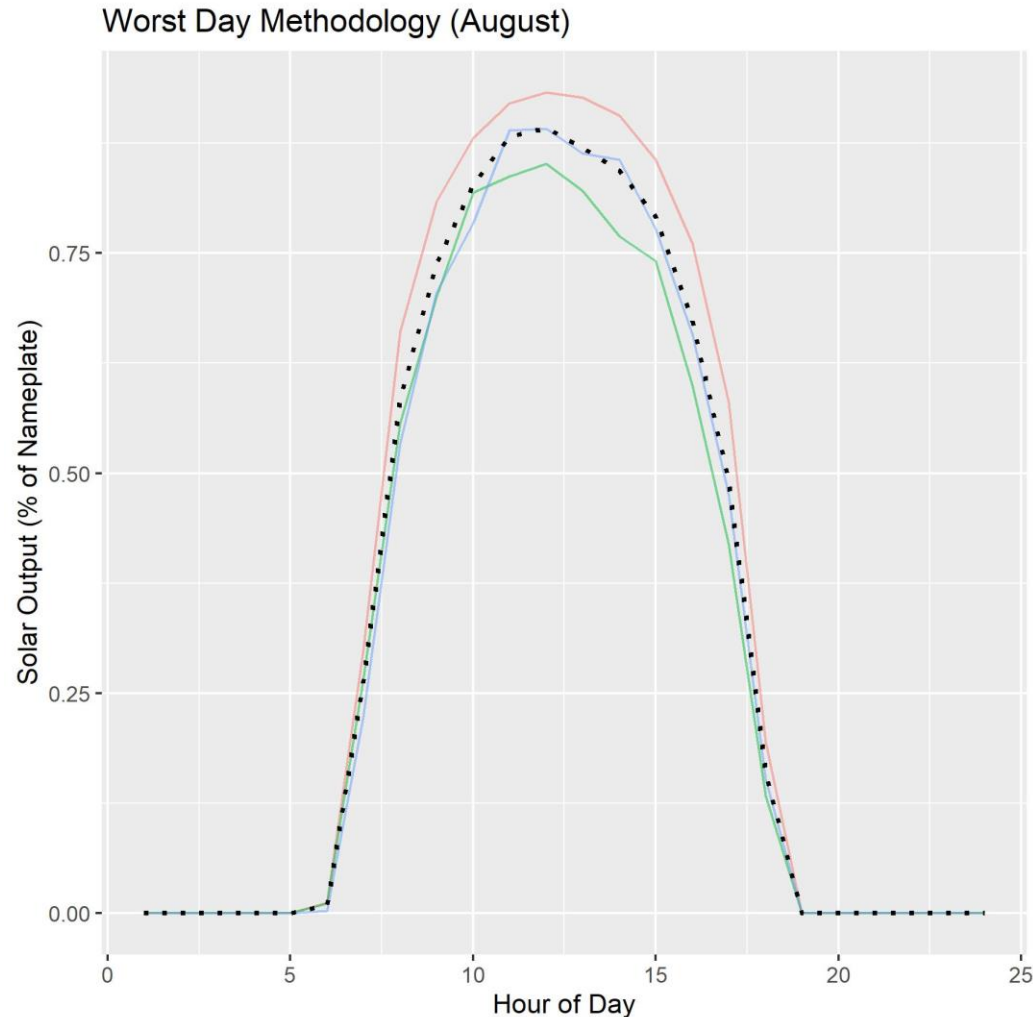
The Worst Day methodology is conceptually similar to Peak Day, but utilizes the profiles of the worst days directly rather than aligning with an exceedance profile.

➢ Under the Worst Day methodology, NRDC proposed averaging a subset of worst days by peak or net peak
  ➢ Days below a specific load or net load threshold would be excluded
  ➢ Days above a specific load or net load threshold would be averaged

➢ Worst Day and Peak Day are very similar:
  ➢ Worst Day builds shapes directly from observed worst days
  ➢ Peak Day aligns an exceedance profile with observed worst days
  ➢ While conceptually similar, these may result in different shapes

Profile Shape Considerations (Selected Results)

CAISO SCE Solar, CAISO SCE Wind, New Mexico Wind

Solar SCE [Solar_CISC]
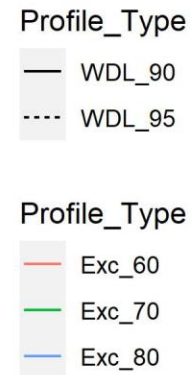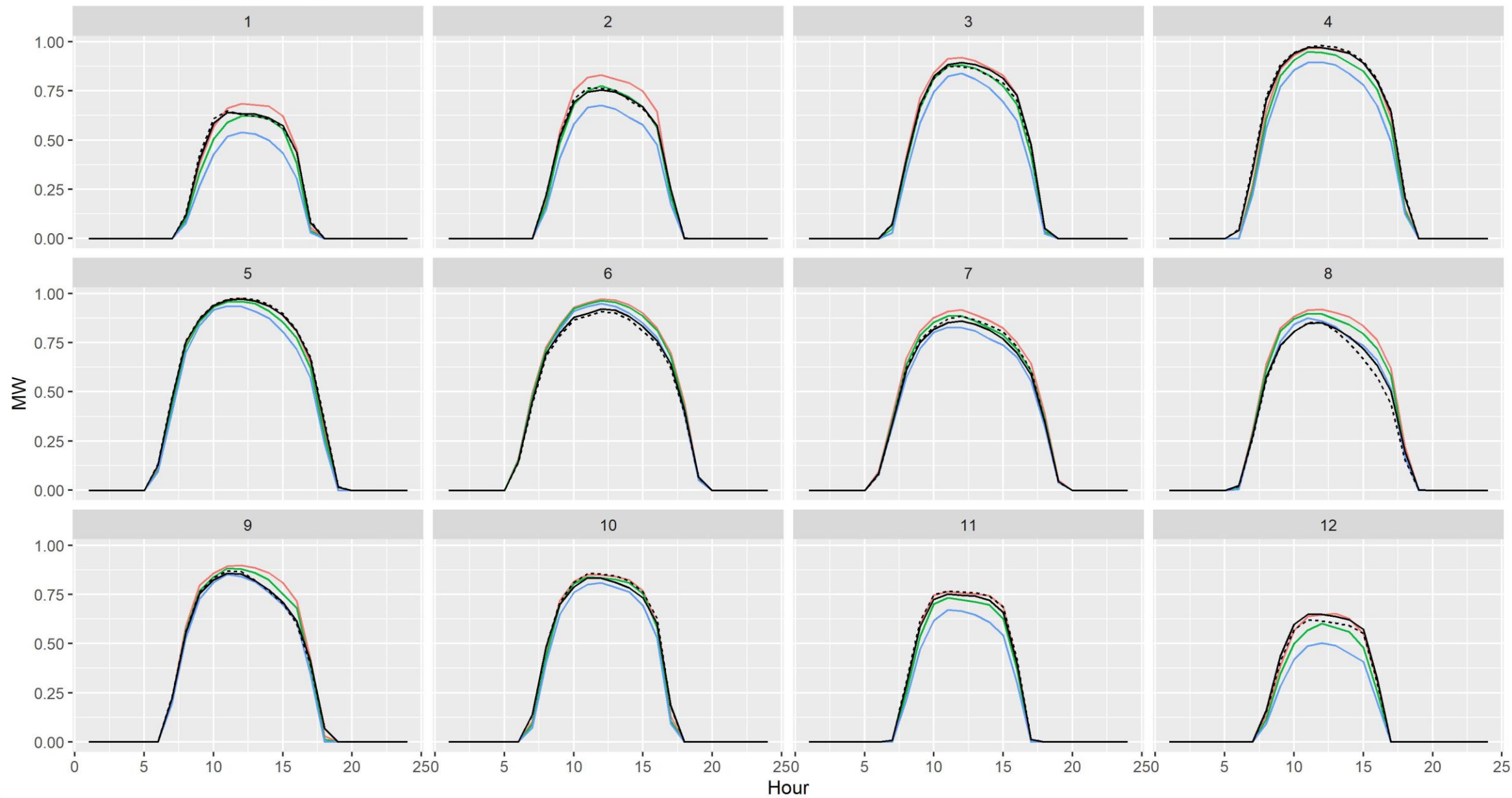
'Error' Between Exceedance and Worst Day 90 (CAISO SCE Solar)
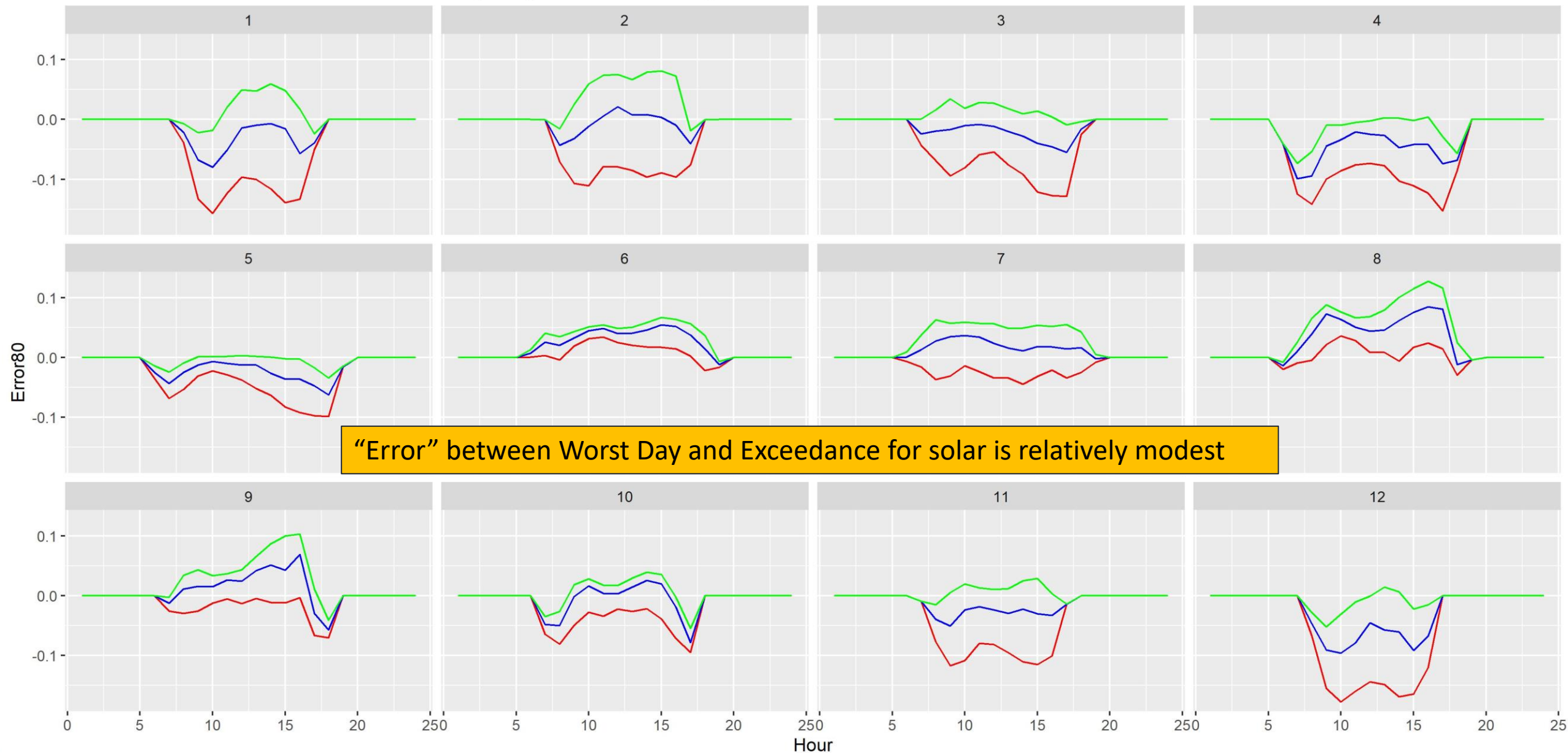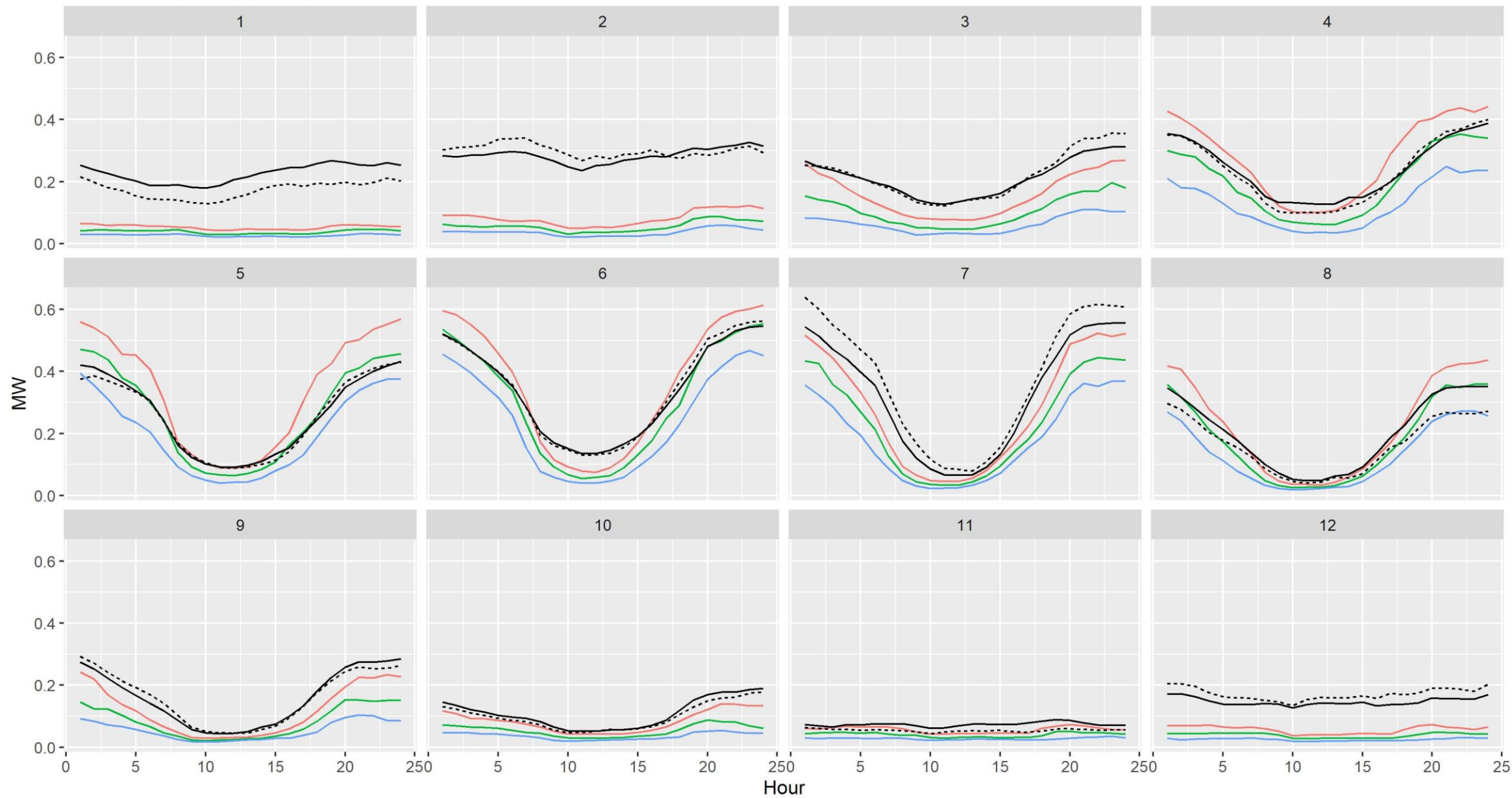
"Error" between Worst Day and Exceedance for solar is relatively modest

Error = Exceedance Profile – Worst Day 90th Percentile   [Positive Error = Exceedance > Worst Day]   **12**

'Error' Between Exceedance and Worst Day 90, September (CAISO SCE Solar)

Error = Exceedance Profile – Worst Day 90th Percentile   [Positive Error = Exceedance Overstates]   **13**
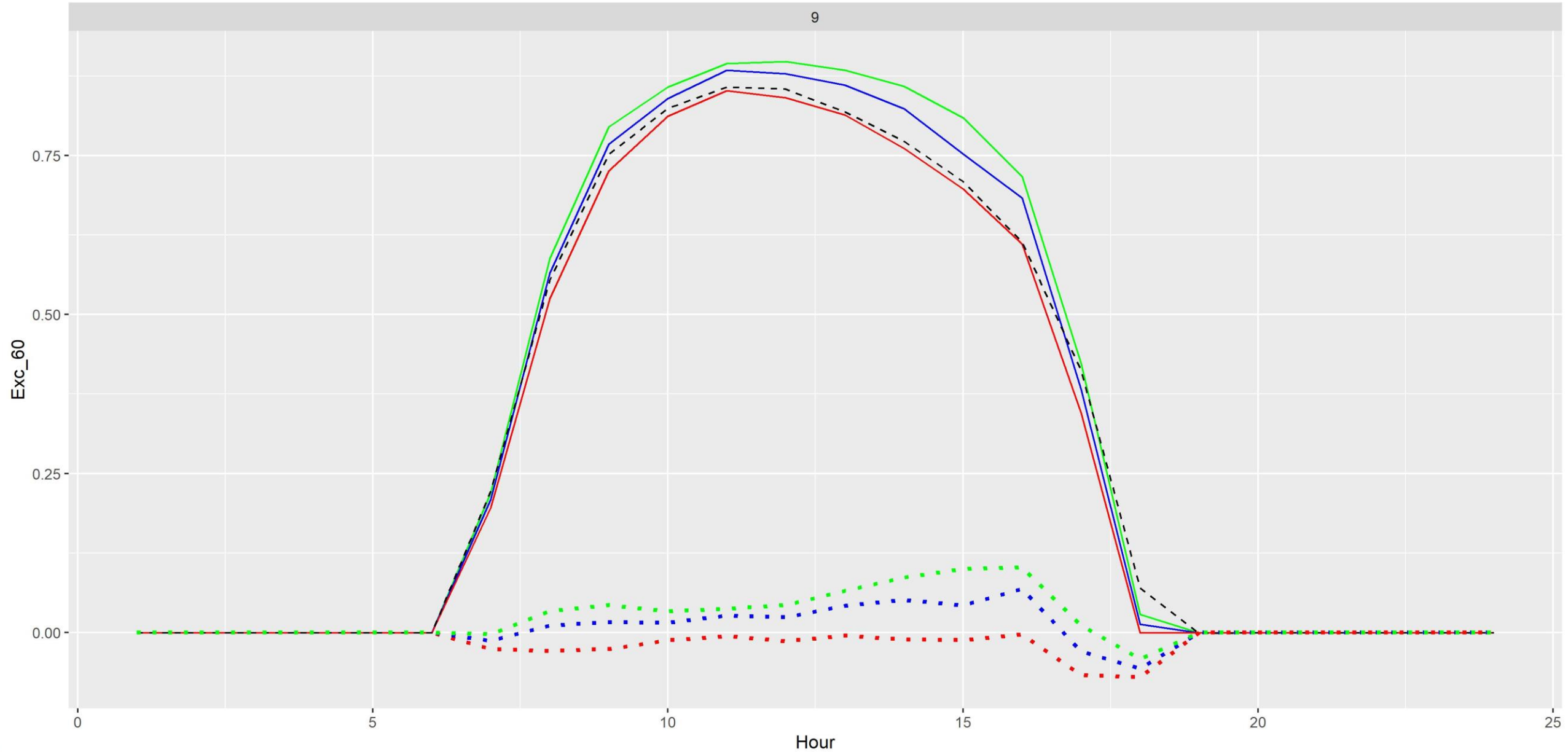
Wind SCE [Wind_CISC]

'Error' Between Exceedance and Worst Day 90 (CAISO SCE Wind)

"Error" between Worst Day and Exceedance for wind is much more variable across hours and months, as high as 20% of nameplate

Error = Exceedance Profile – Worst Day 90th Percentile   [Positive Error = Exceedance > Worst Day]   **15**
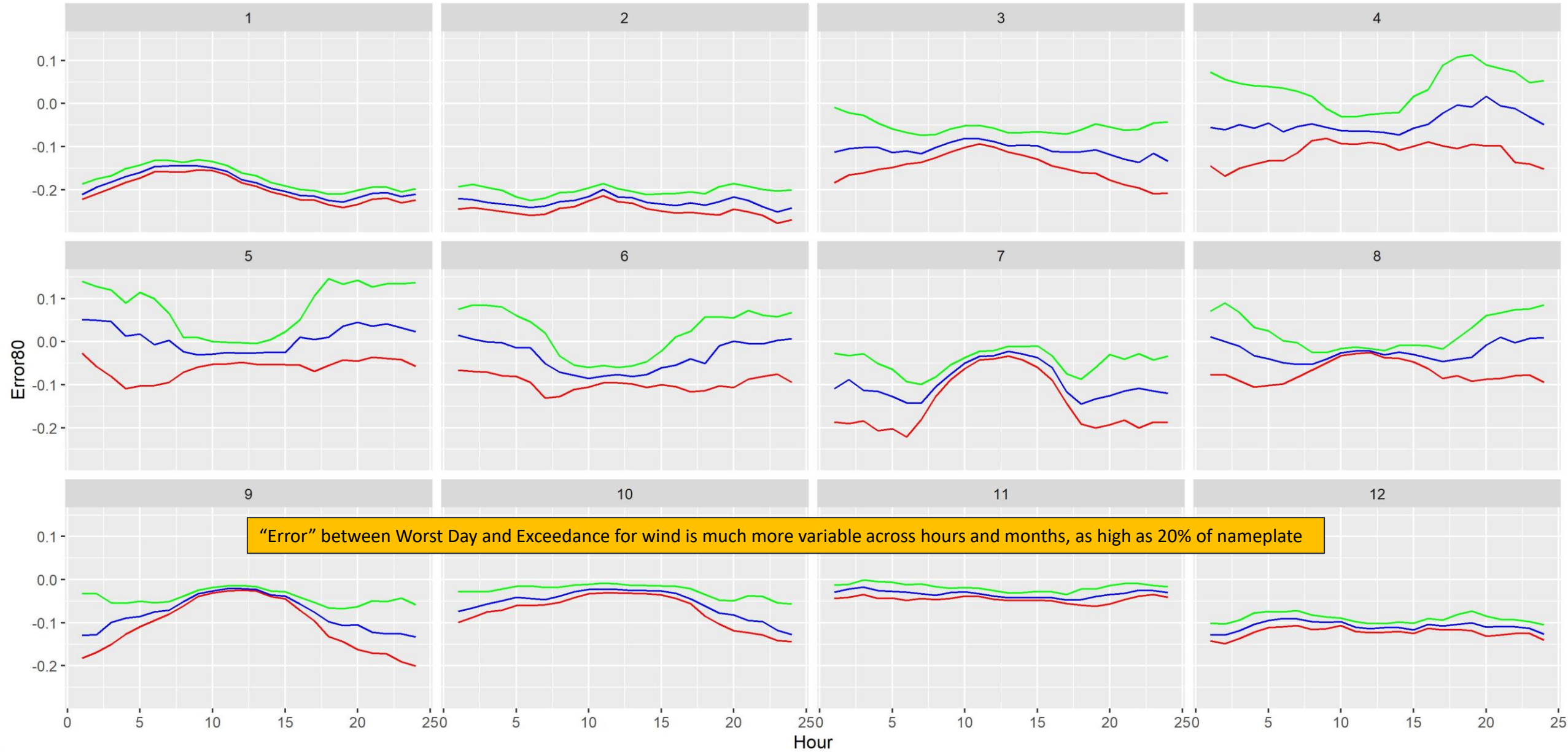
'Error' Between Exceedance and Worst Day 90, September (CAISO SCE Wind)
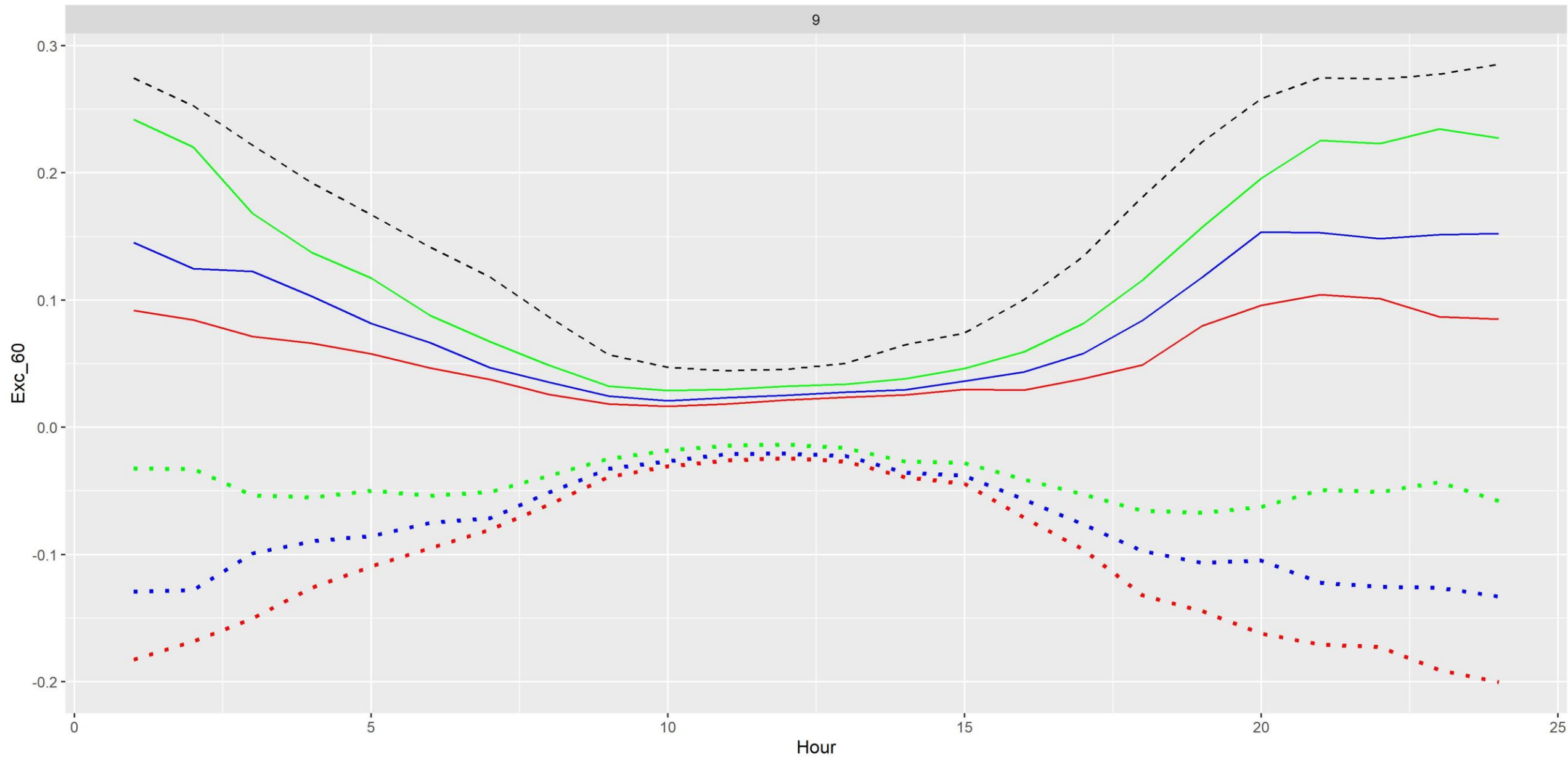
Wind Public Service Company of NM [Wind_PNM]
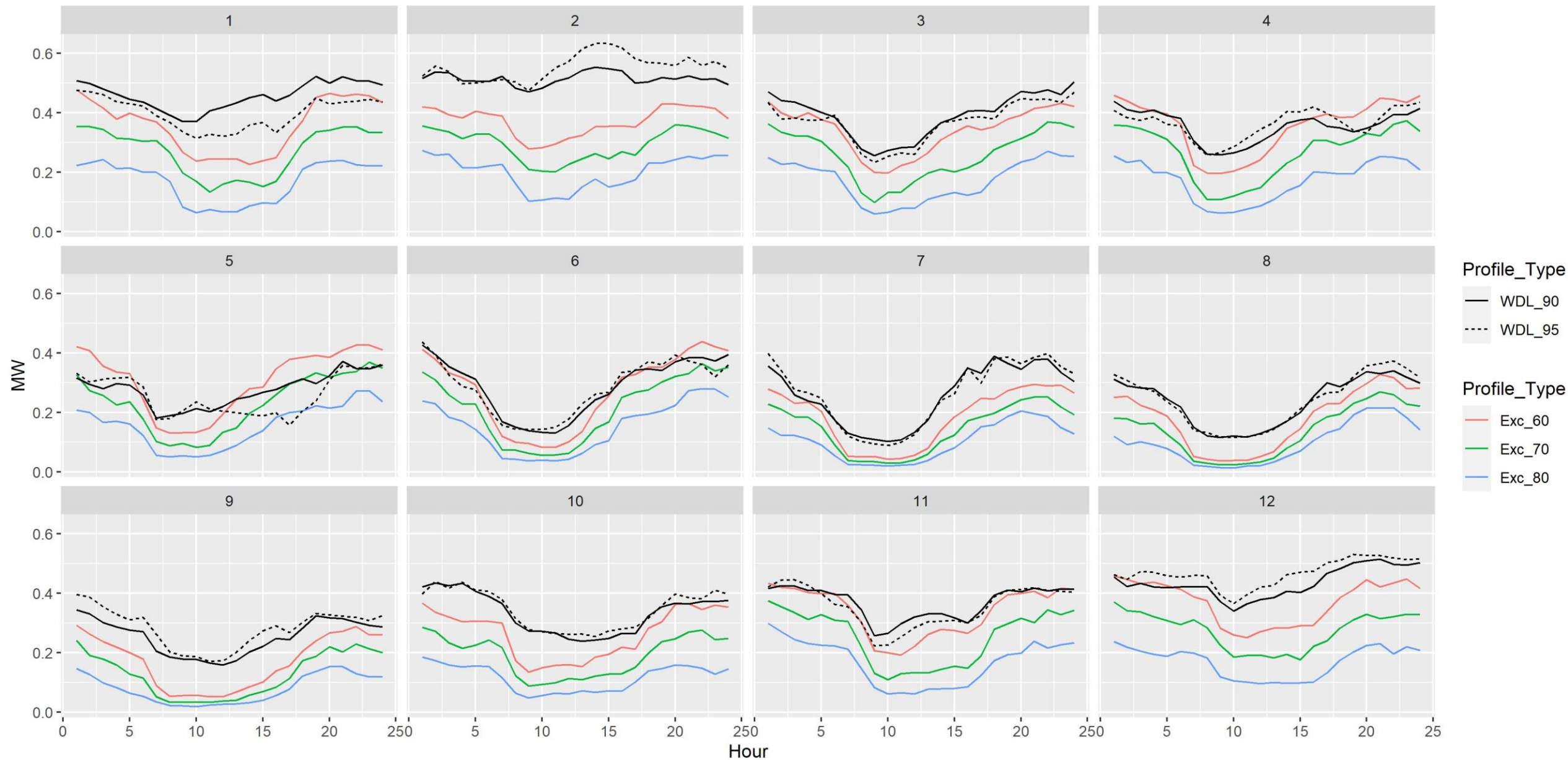
'Error' Between Exceedance and Worst Day 90 (PNM Wind)

"Error" between Worst Day and Exceedance for OOS wind is much more variable across hours and months, as high as 40% of nameplate
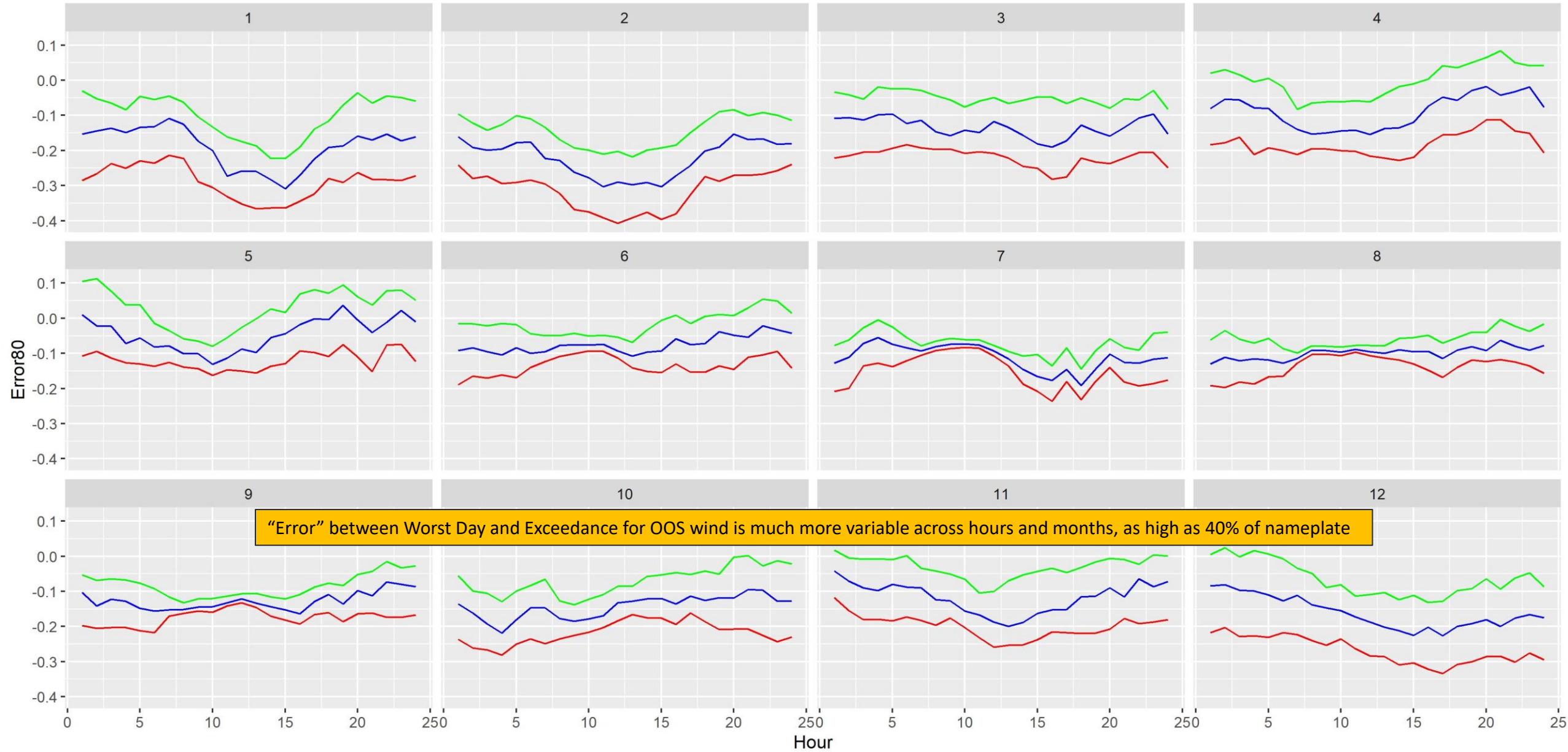
'Error' Between Exceedance and Worst Day 90, September (PNM Wind)

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Appendix
Resource Profile Results

Resource Profiles – CAISO Solar

Solar PG&E Bay [Solar_CIPB]
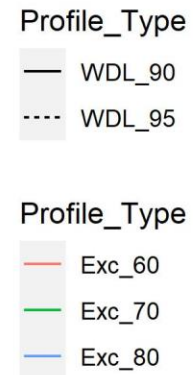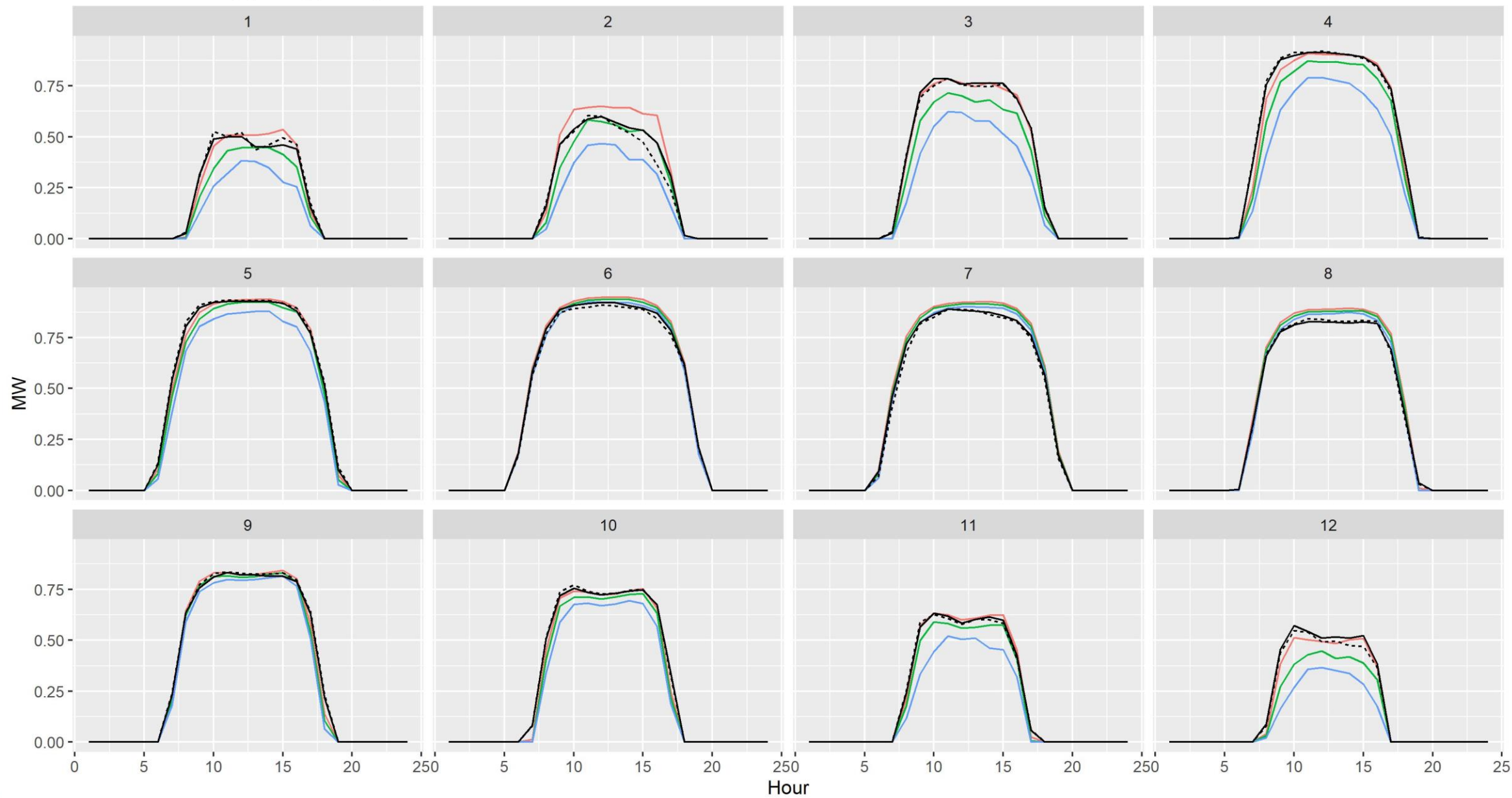
Solar PG&E Valley [Solar_CIPV]
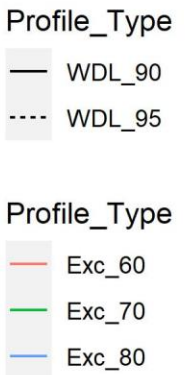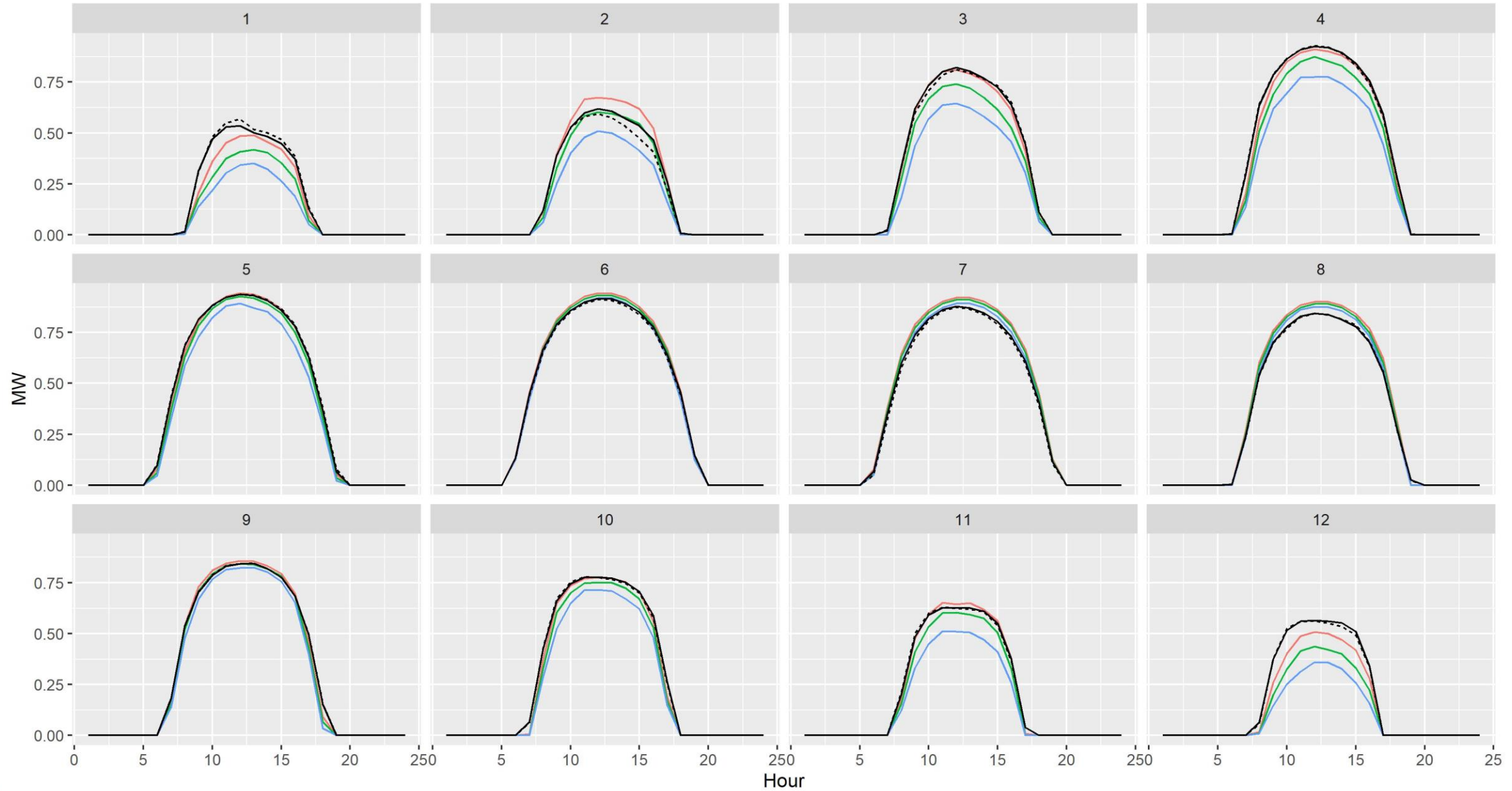
Solar SCE [Solar_CISC]
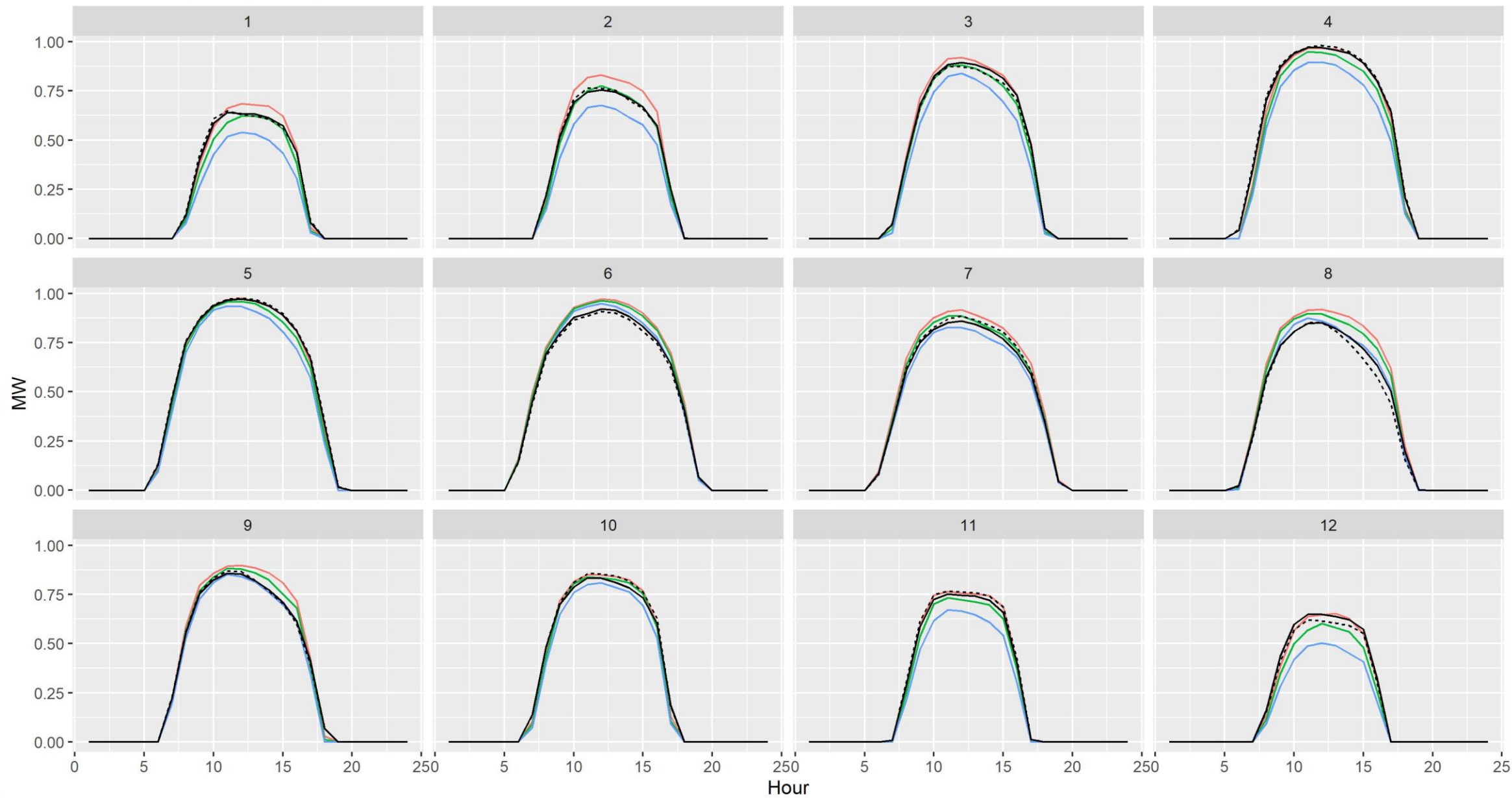
Solar SDG&E [Solar_CISD]
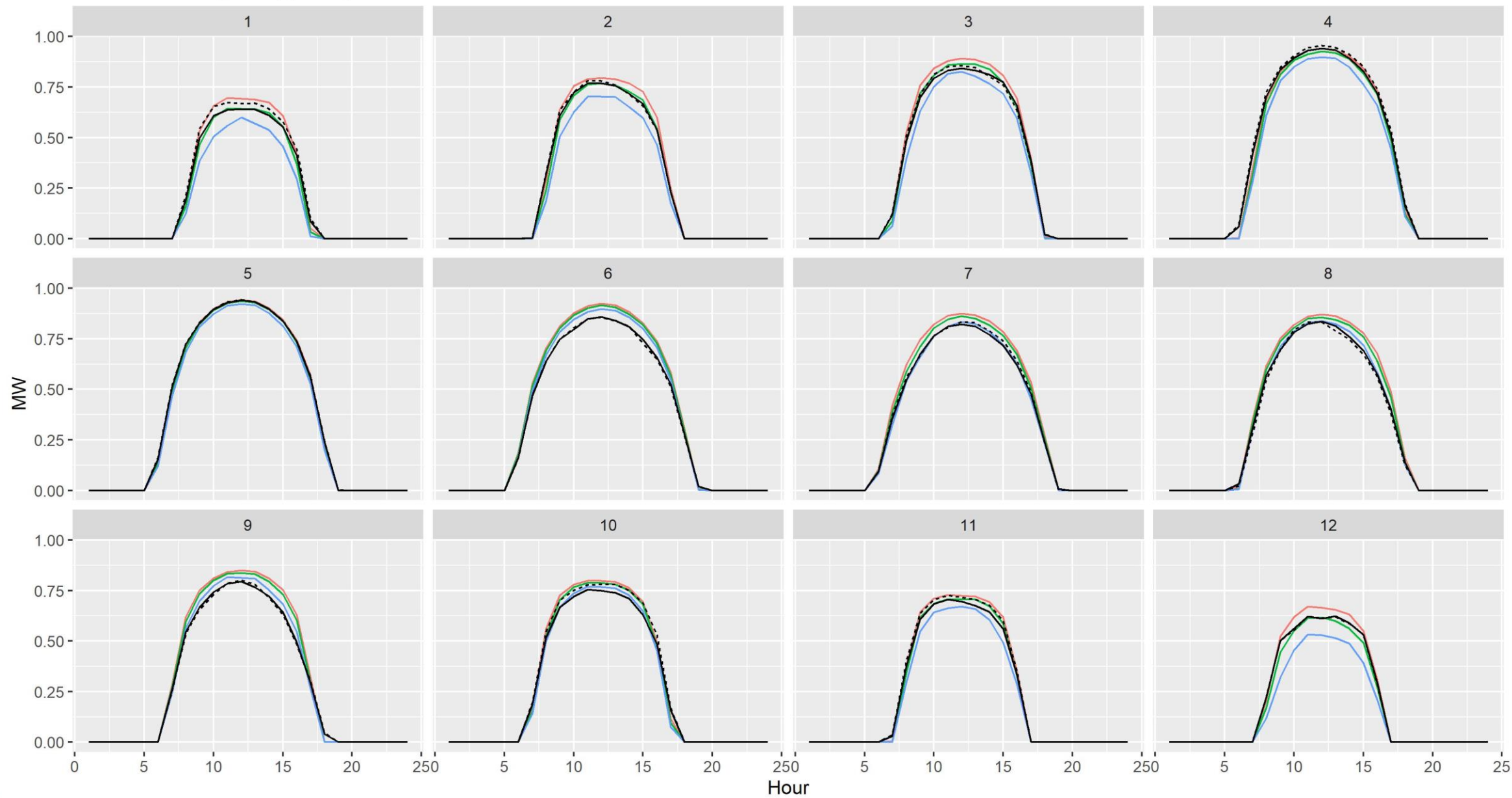
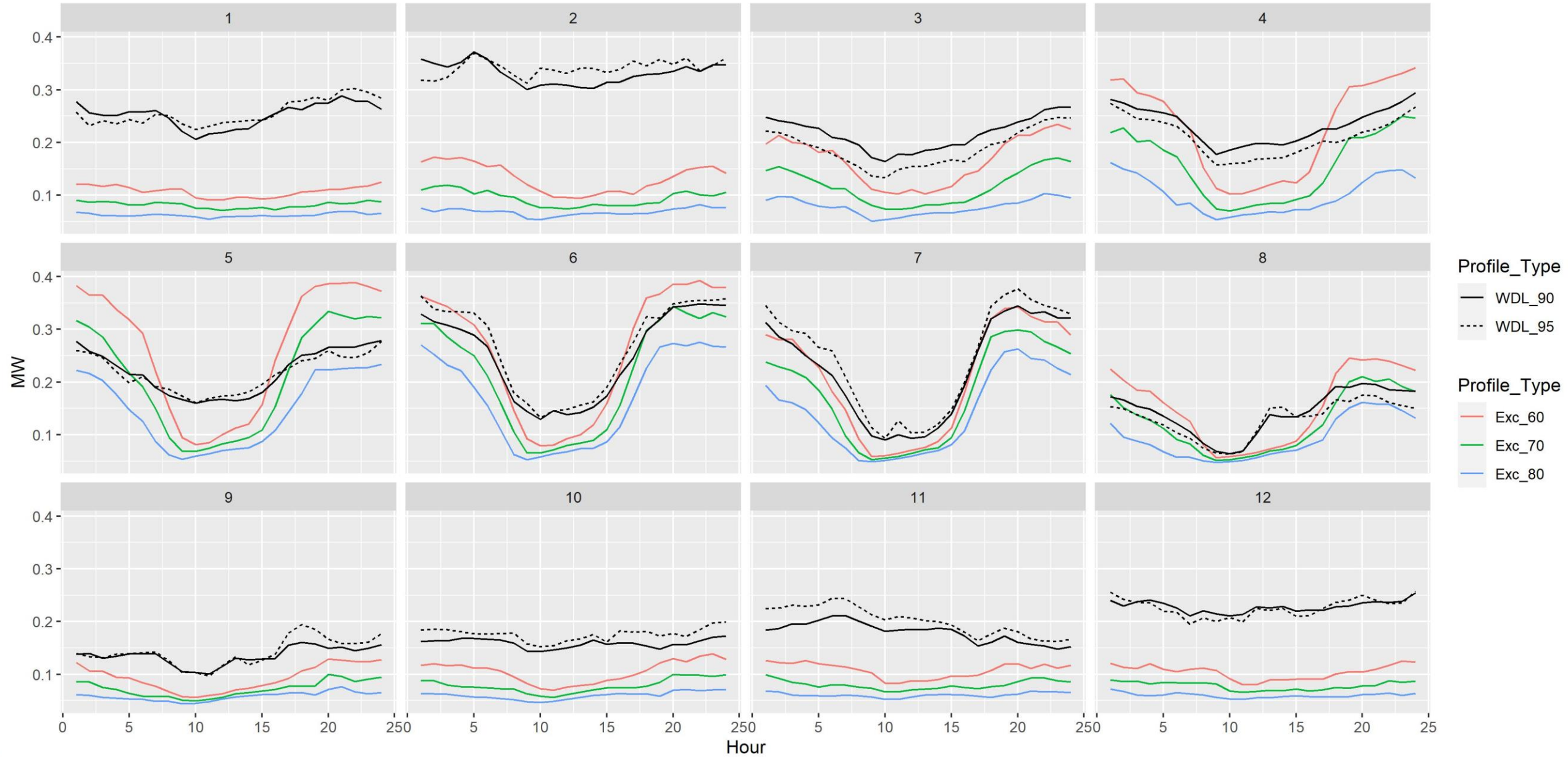# Resource Profiles – CAISO Wind

Wind PG&E Bay [Wind_CIPB]
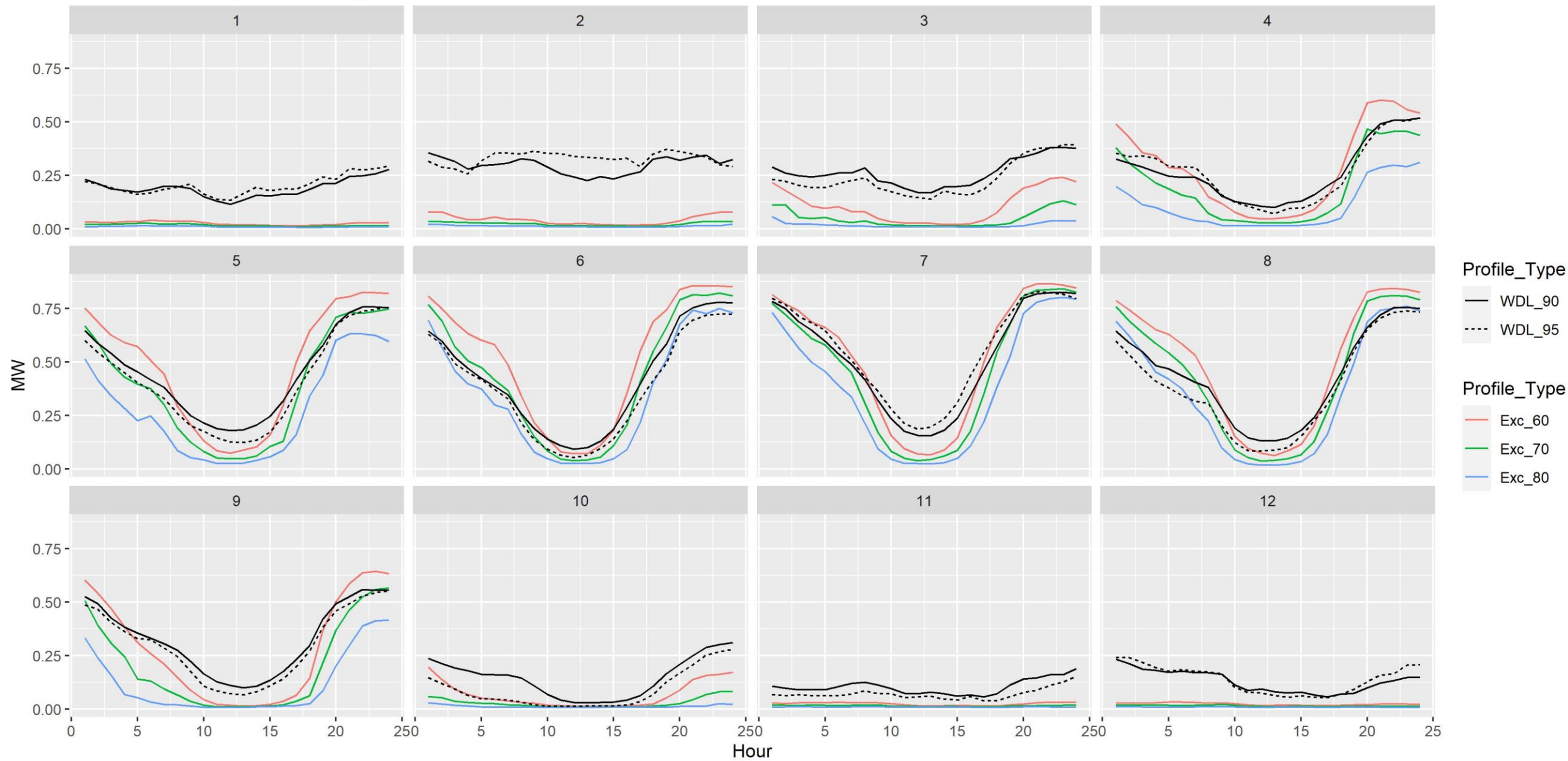
Wind PG&E Valley [Wind_CIPV]
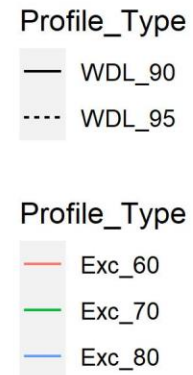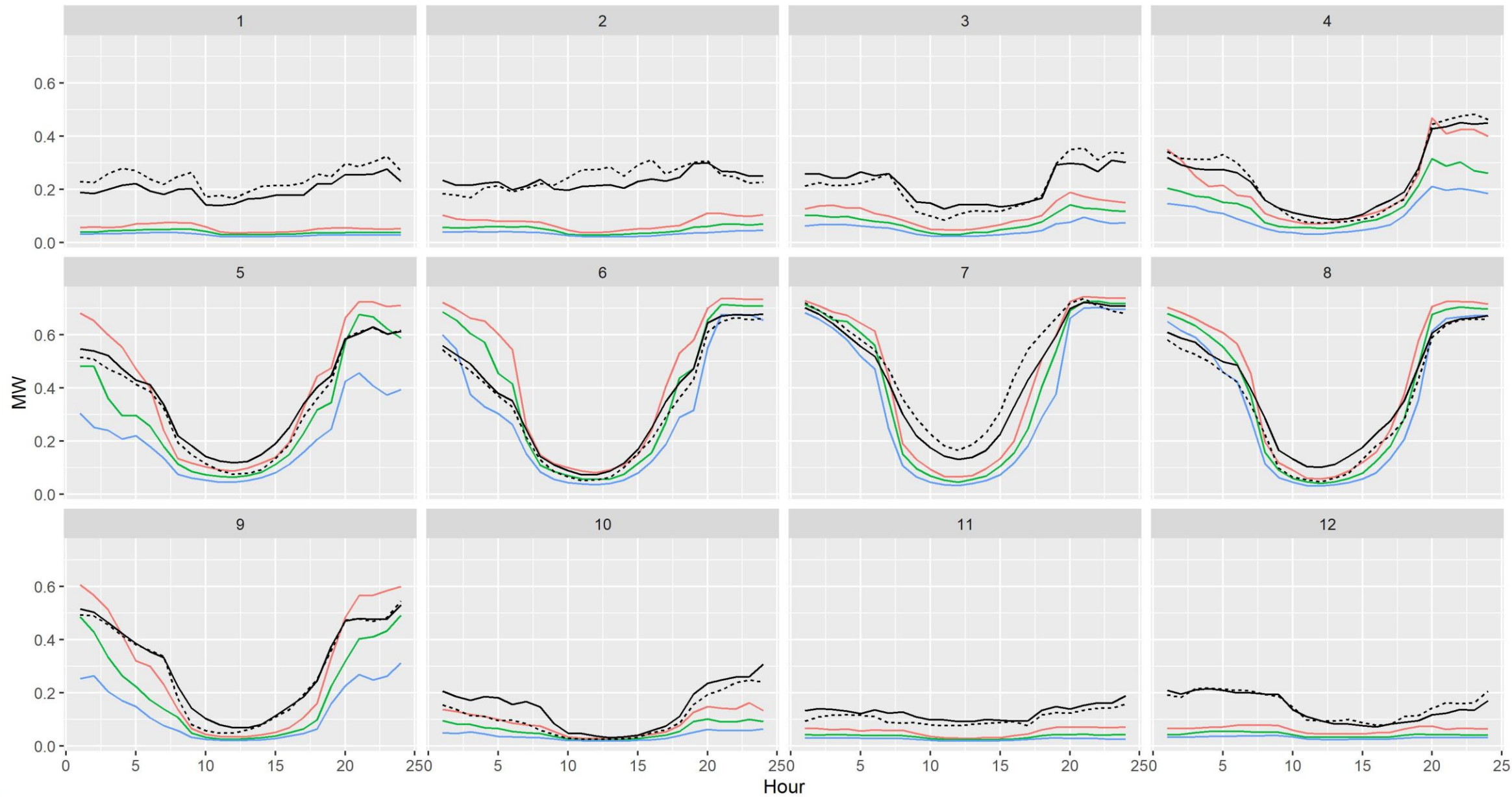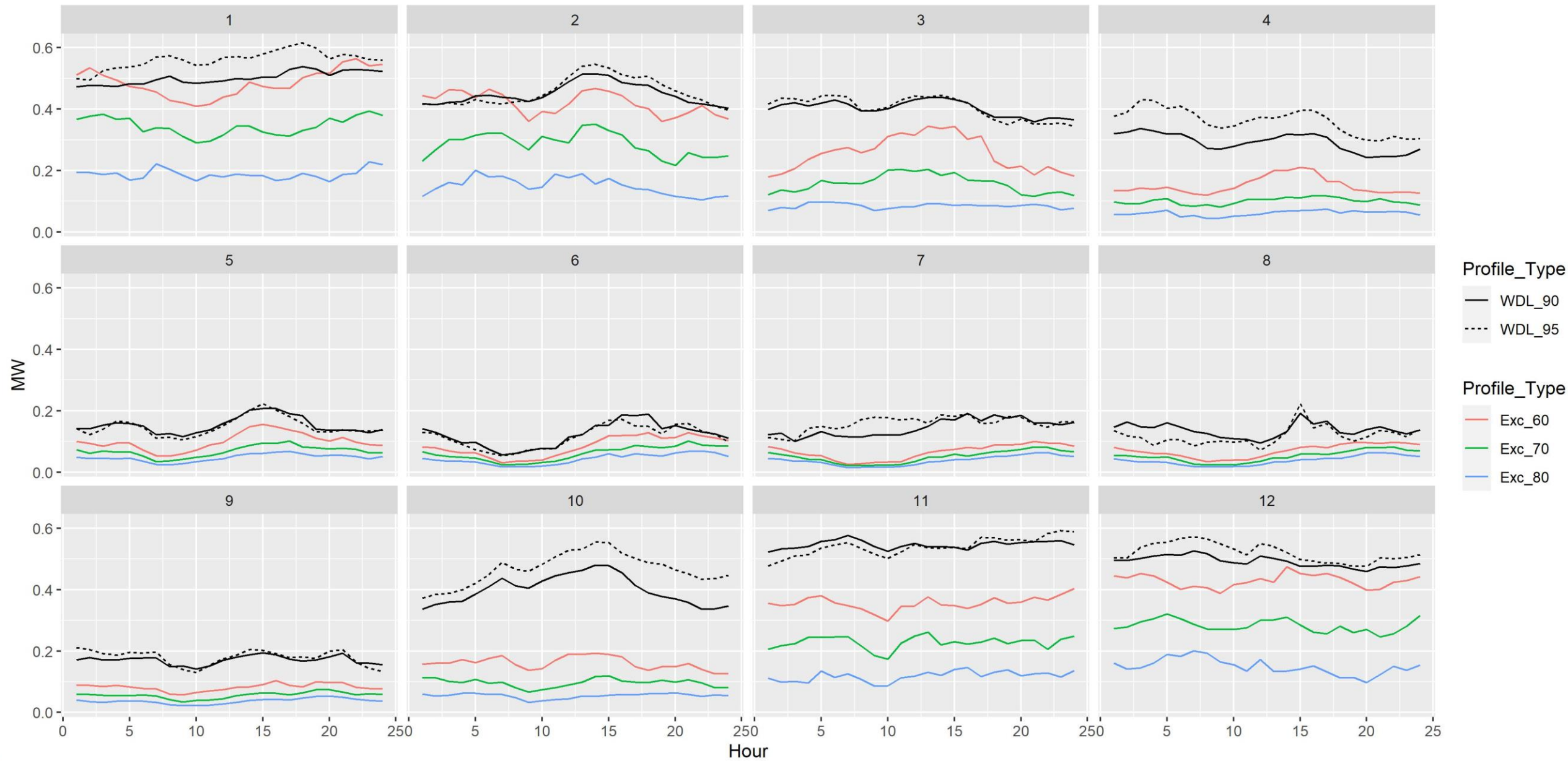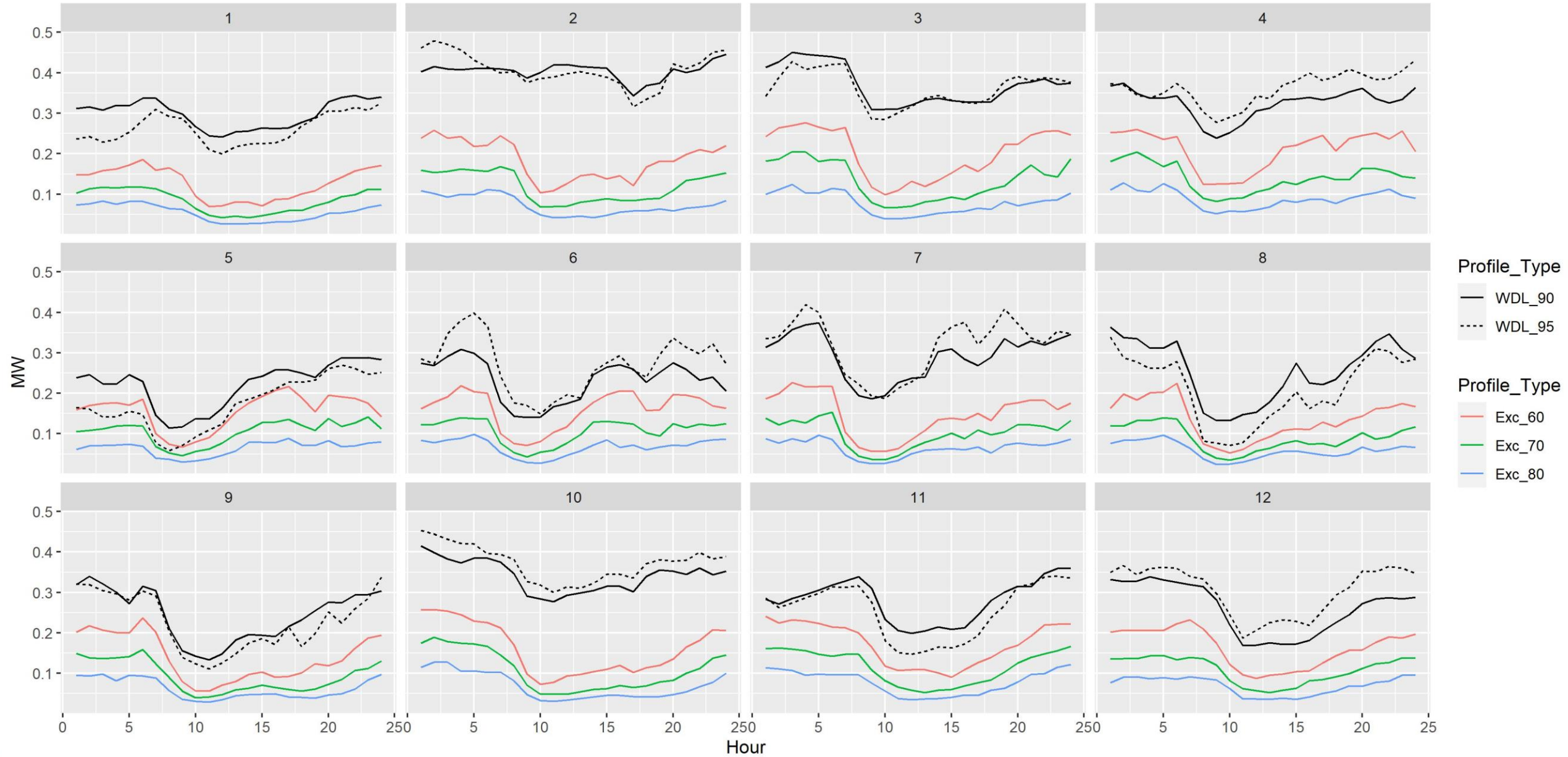
Wind SCE [Wind_CISC]

Wind SDG&E [Wind_CISD]

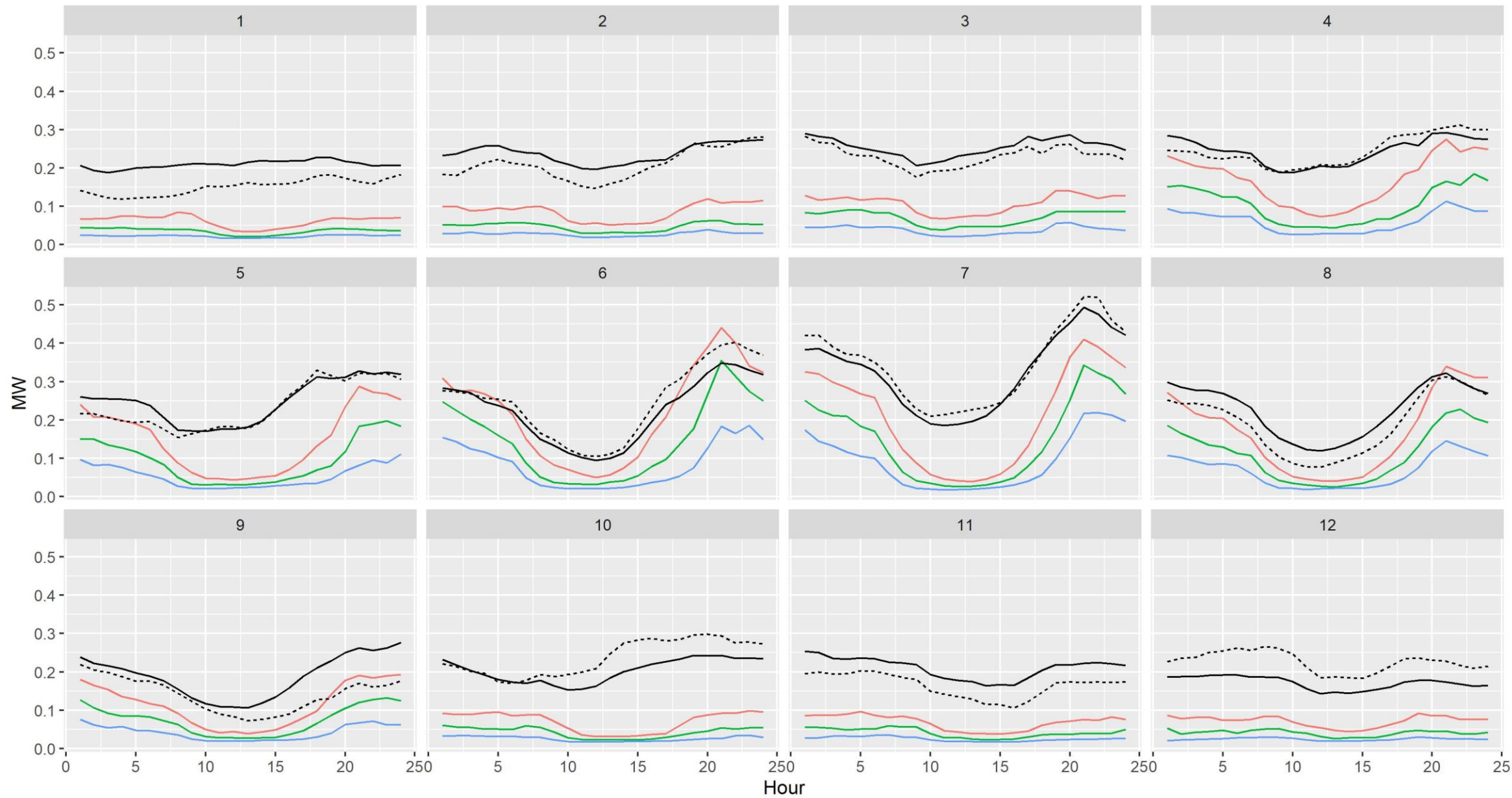# Resource Profiles – OOS Wind

Wind Pacificorp Wyoming [Wind_PAWY]

Wind Pacificorp Idaho [Wind_PAID]

Wind Bonneville [Wind_BPAT]

Wind Public Service Company of NM [Wind_PNM]