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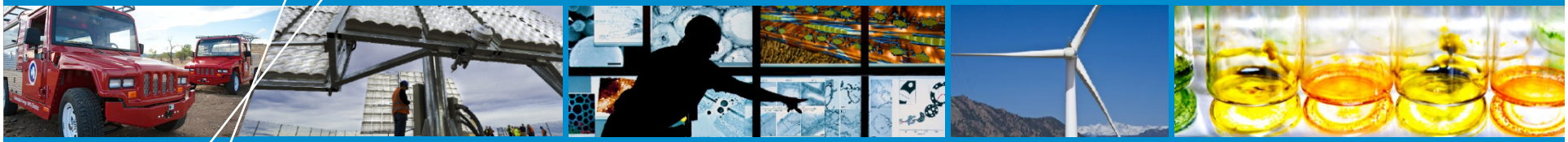


# WWSIS2 TRC June meeting

# Topics

- Status update on data preparation
- DA UC, 4HA UC, RT dispatch sequence
- How to commit nuclear?
- Hydro re-dispatch for 4HA and RT
- Reserve methodology
- Next call

# Data preparation nearly complete

- **Solar PV and CSP DA (hourly), 4HA (hourly), RT (5-min)**
- **Wind DA (hourly), 4HA (hourly), RT (5-min)**
- **Load hourly and 5-min (assume perfect forecasts)**
- **AS markets (Reg, Flex, Contingency) time series script done for DA, 4HA, and RT markets**
- **Implementation complete in PLEXOS**
  - A few bugs to be worked out during runs
  - Several "knobs" to be turned

# Unit commitment and dispatch sequence

DA commitment
Commit long-start generators
Hourly resolution
48 hr UC window
Run every 24 hrs

↓

4HA commitment
Commit medium-start generators
Hourly resolution
8 hr UC window
Run every 4 hrs

↓

RT commitment and dispatch
Commit fast-start generators
5-minute resolution
? UC window (test)
Run every ? minutes (test)

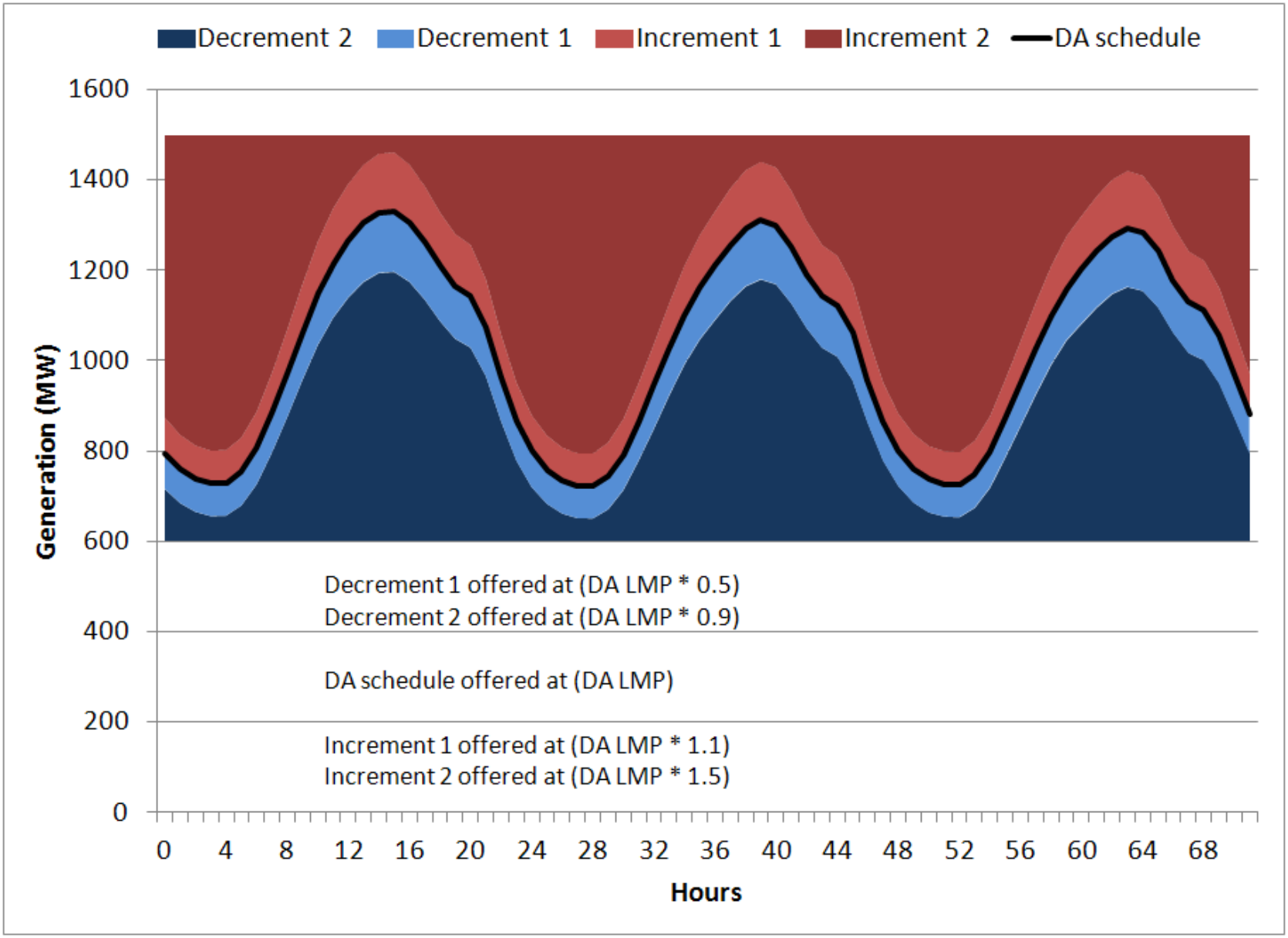
# Commitment horizon by unit type

- **Must-run**
  - Nuclear
- **DA commitment**
  - Coal, biomass
- **4HA commitment**
  - Combined cycle, gas boiler/steam?
- **RT commitment/dispatch**
  - Combustion turbine, internal combustion?

# Nuclear proposal

- **Require must run**
  - Sensitivities later
    - Allow UC using high start-costs
    - Keep units offline during low-price (high-curtailment) times of year
- **Assume minimum stable level 95% of max capacity**
  - TEPPC assumes 50%

# Hydro adjustment between DA, 4HA, RT



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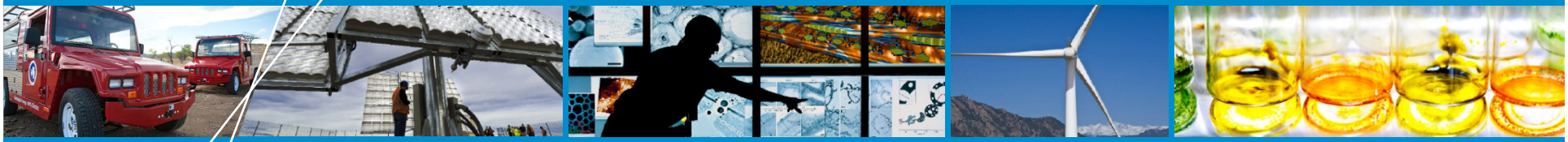


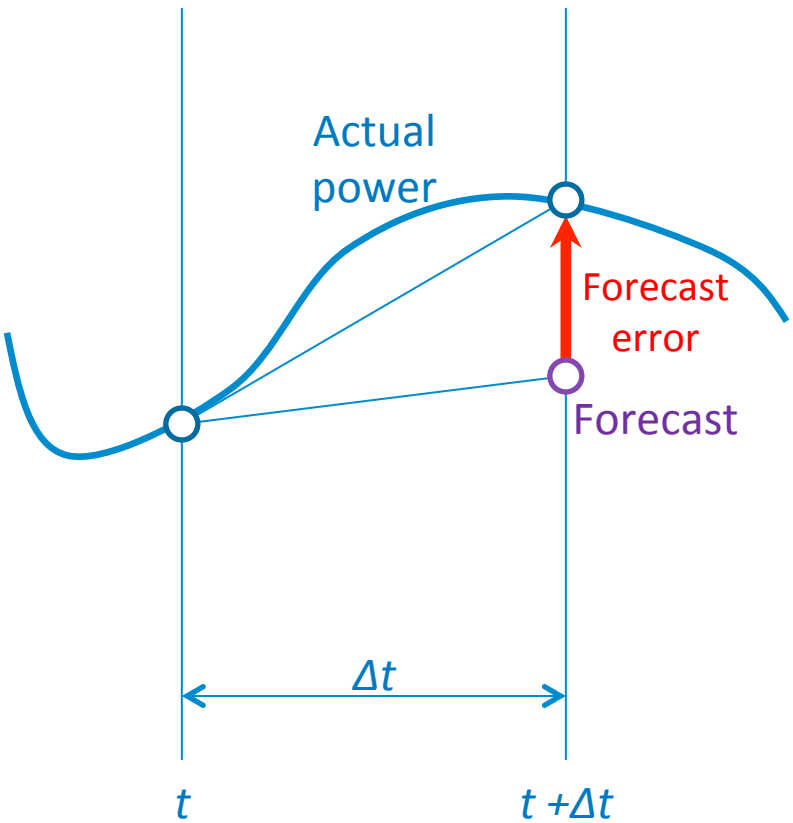
# Reserves for WWSIS-2

# Overview

- **Expand the EWITS methodology to include wind, solar and load**
- **Main concepts:**
  - Using explanatory variables, divide the data into similar groups
  - Within each group, the requirement covers X% of events (non-parametric)
  - Apply those requirements to time series (real-time, day ahead, 4-h ahead) and create dynamic reserves
  - Geometrically add wind, solar (and load)

# Defining requirements

- **Determine *Δt* for product**
- **Define a forecast for *t +Δt* based on time *t***
- **Calculate forecast error at *t+Δt* (red arrow)**



# Three type of reserves

- **Regulation (WECC)**
  - Load: 1% requirement
  - Wind, solar:
    - 10-min ramps
    - 95% confidence interval
- **Flex reserves (20 reserve zones)**
  - No load contribution
  - Wind, solar:
    - 60-min ramps
    - 70% confidence interval
- **Contingency (not affected by renewables)**
  - 3% of load

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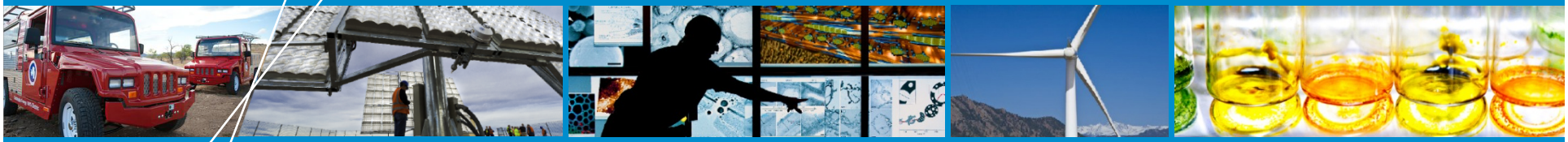
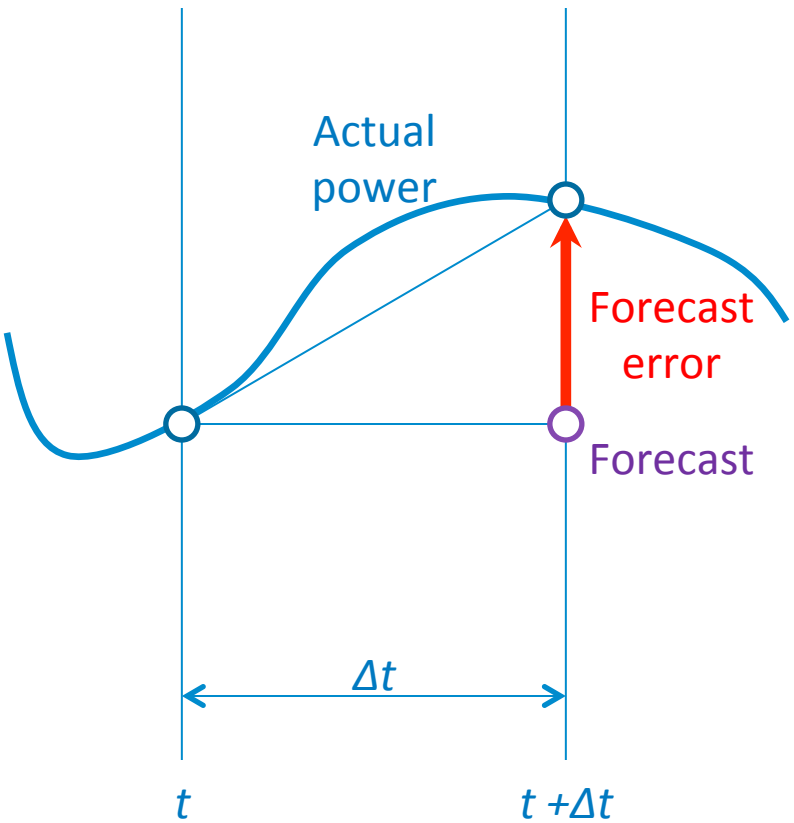


# Wind

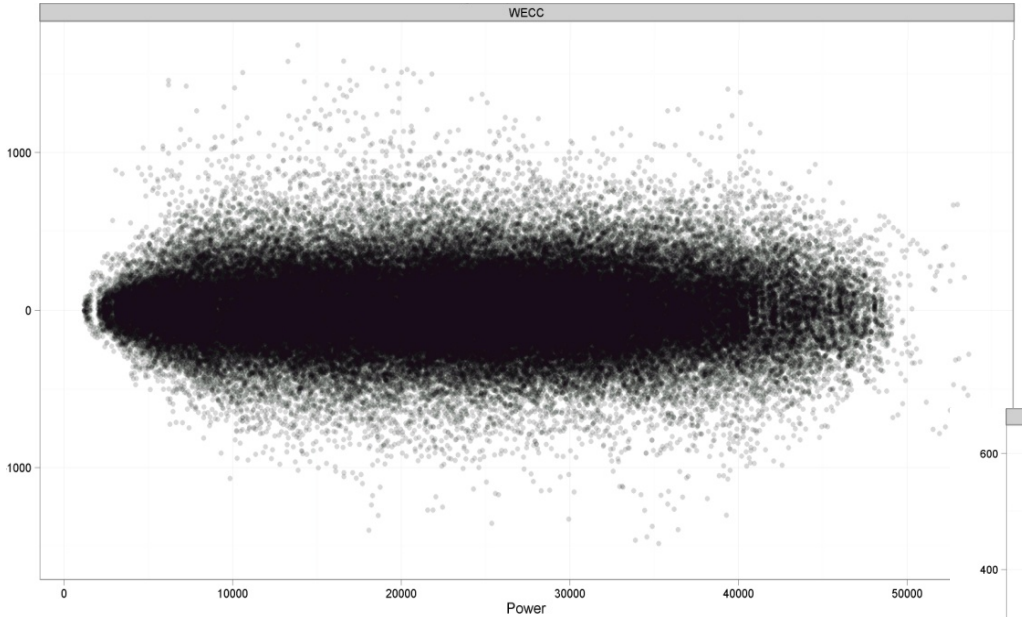
# Wind

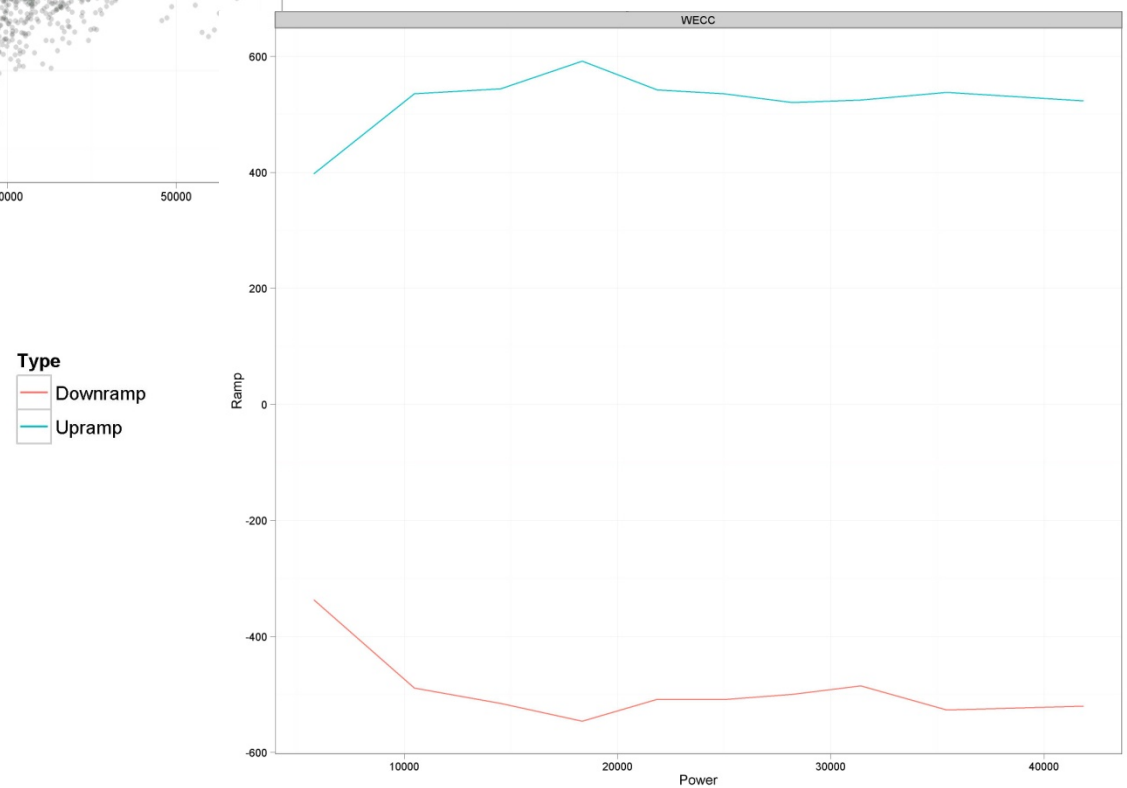
- **Explanatory variable: Power output at *t***
- **Forecast = Power(t)**

  ***(Persistence)***



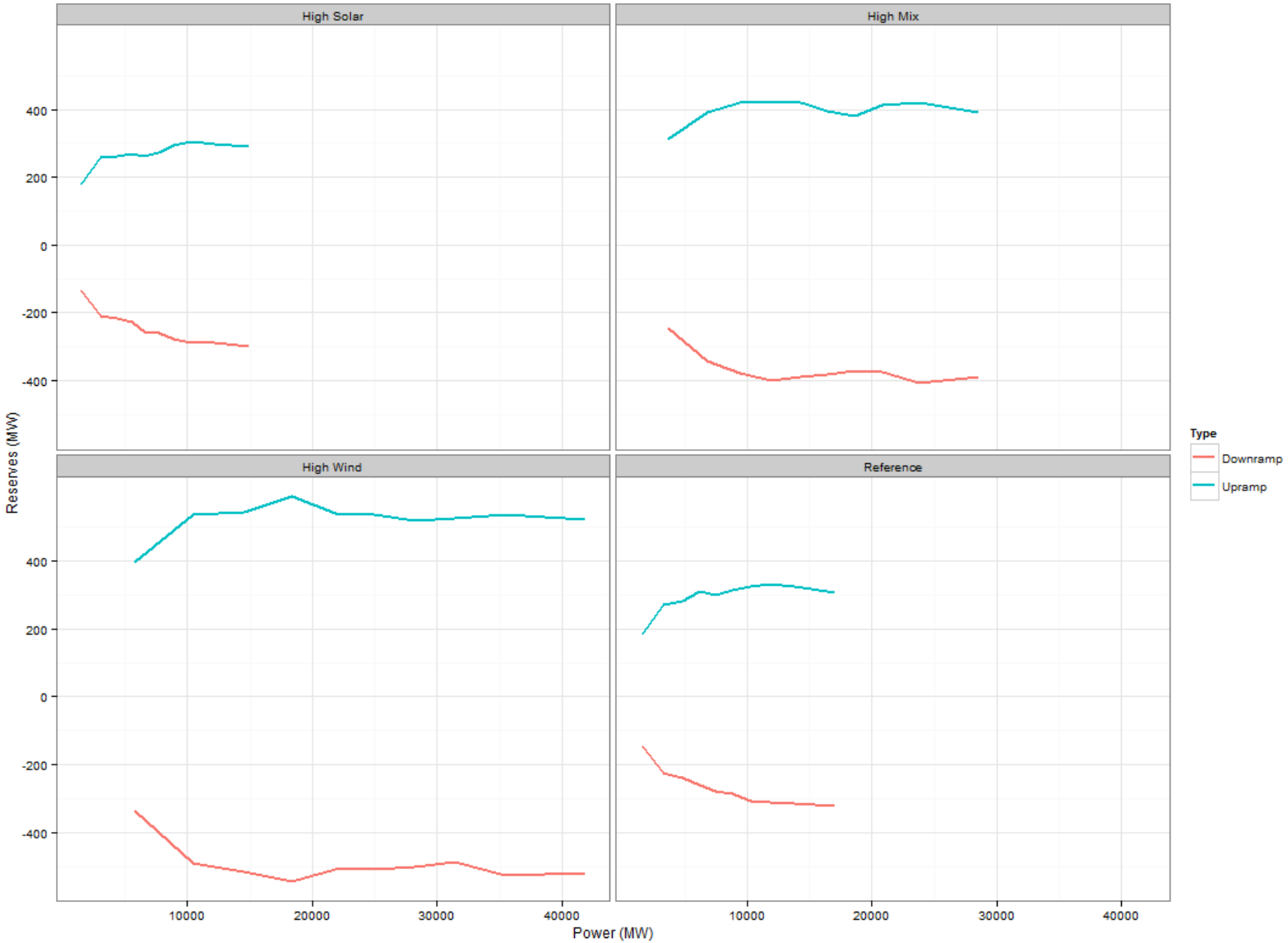
# Wind regulation reserves (I)



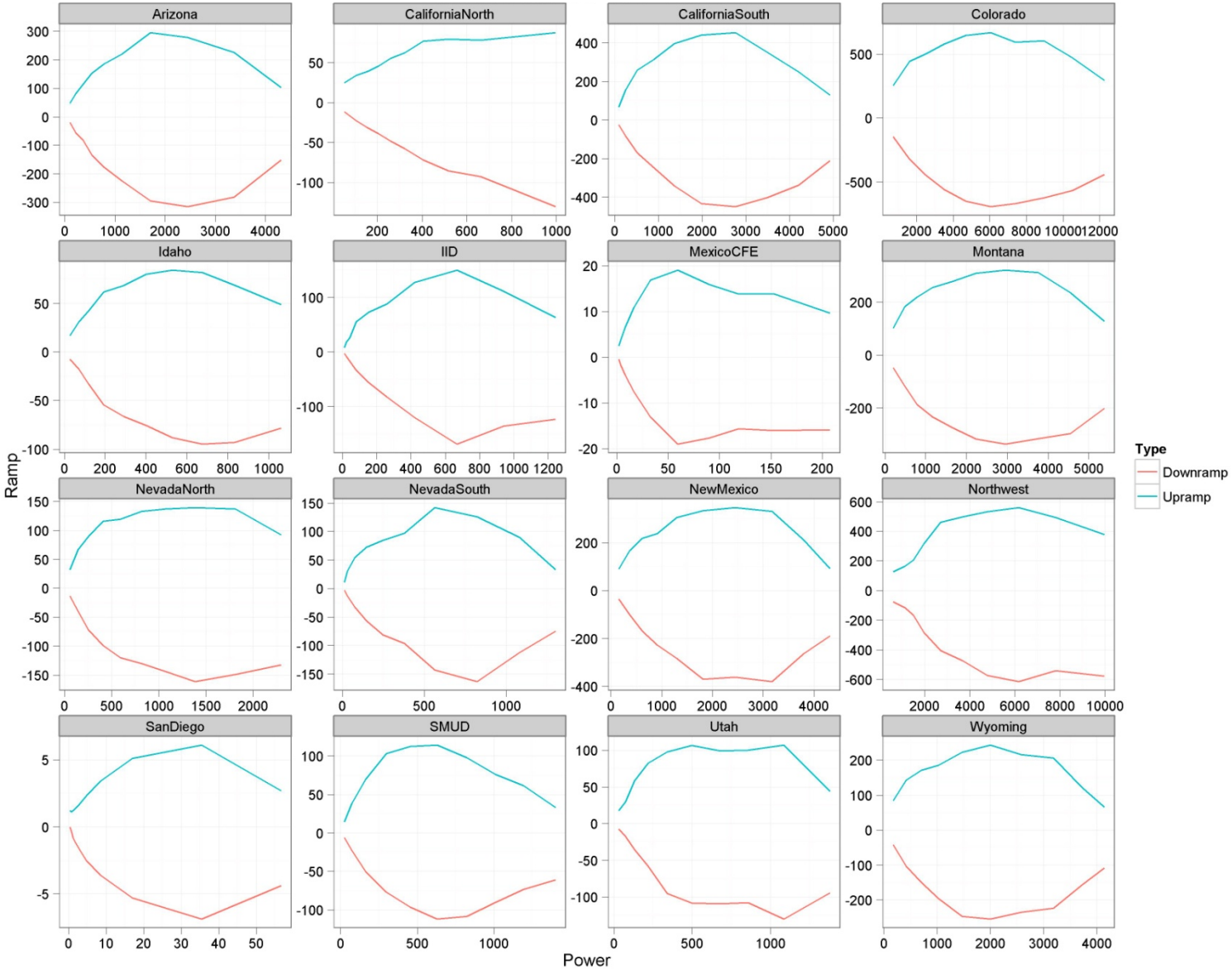




High wind scenario

# Wind regulation reserves (II)



# Wind flex reserves for High Wind



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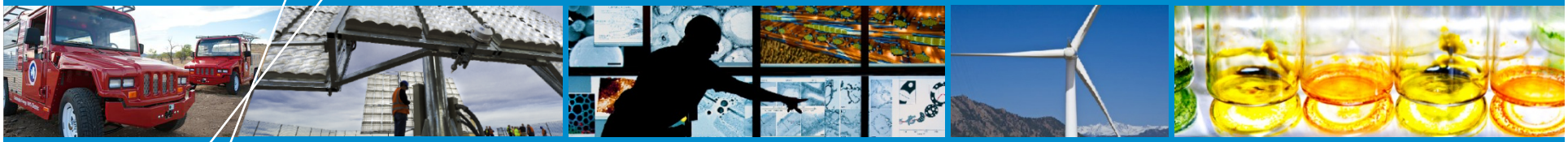


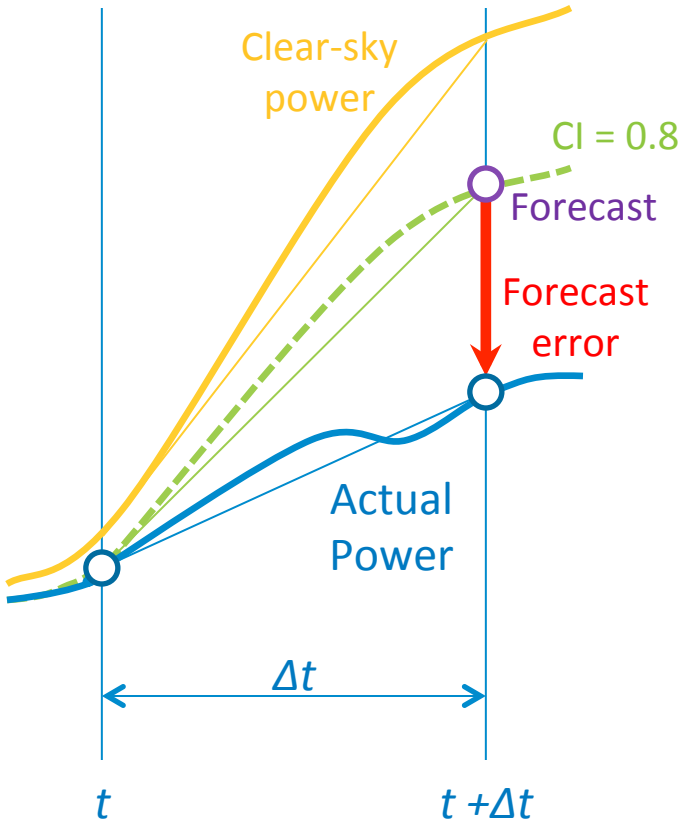
# Solar

# Solar

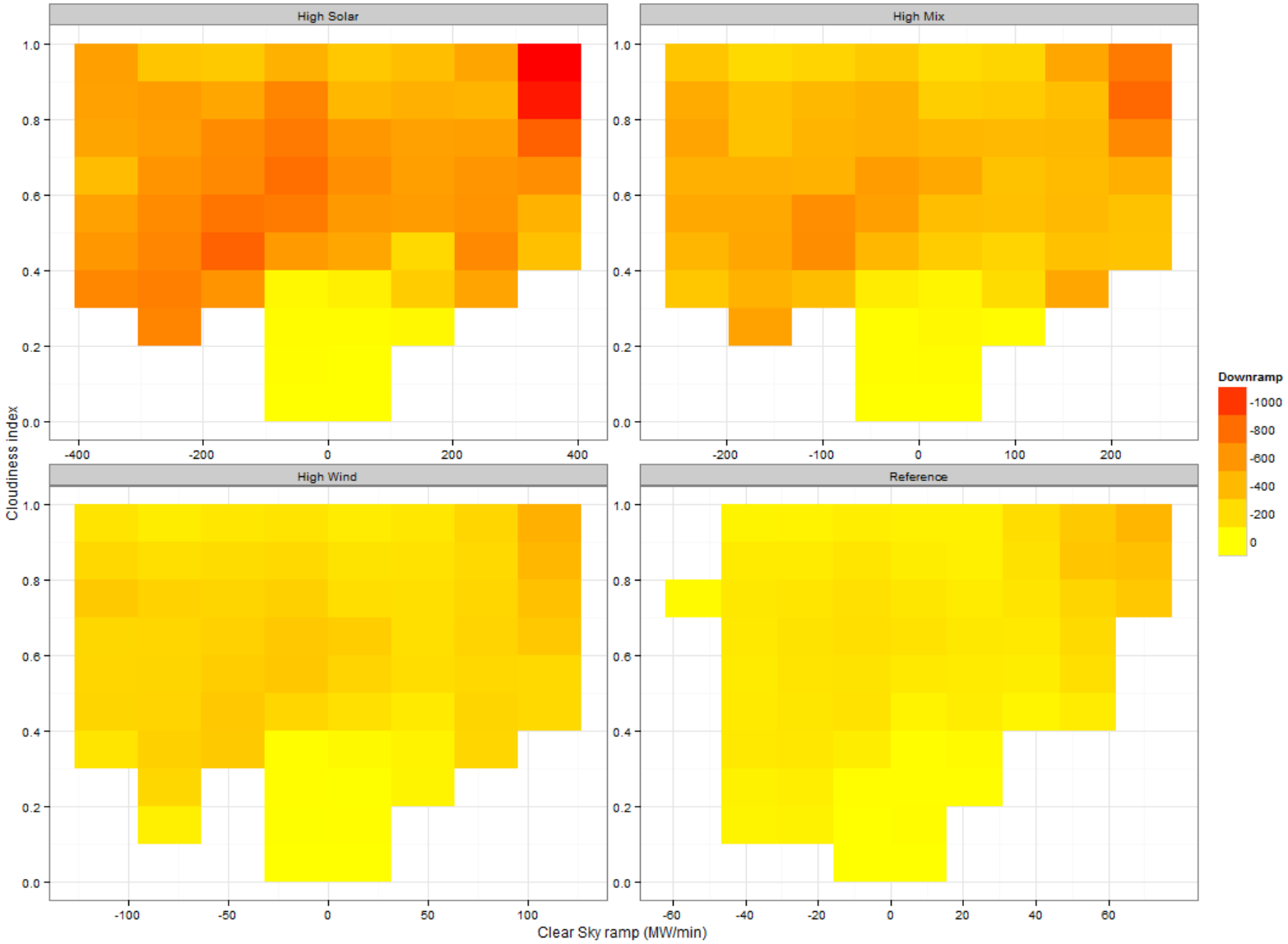
- **Explanatory variables:**
  - Clear-sky power ramps
  - "Cloudiness index" (CI) = Power / Clear-sky pwr

- **Forecast = Power(t) + CI * ClearSkyRamp(t)**

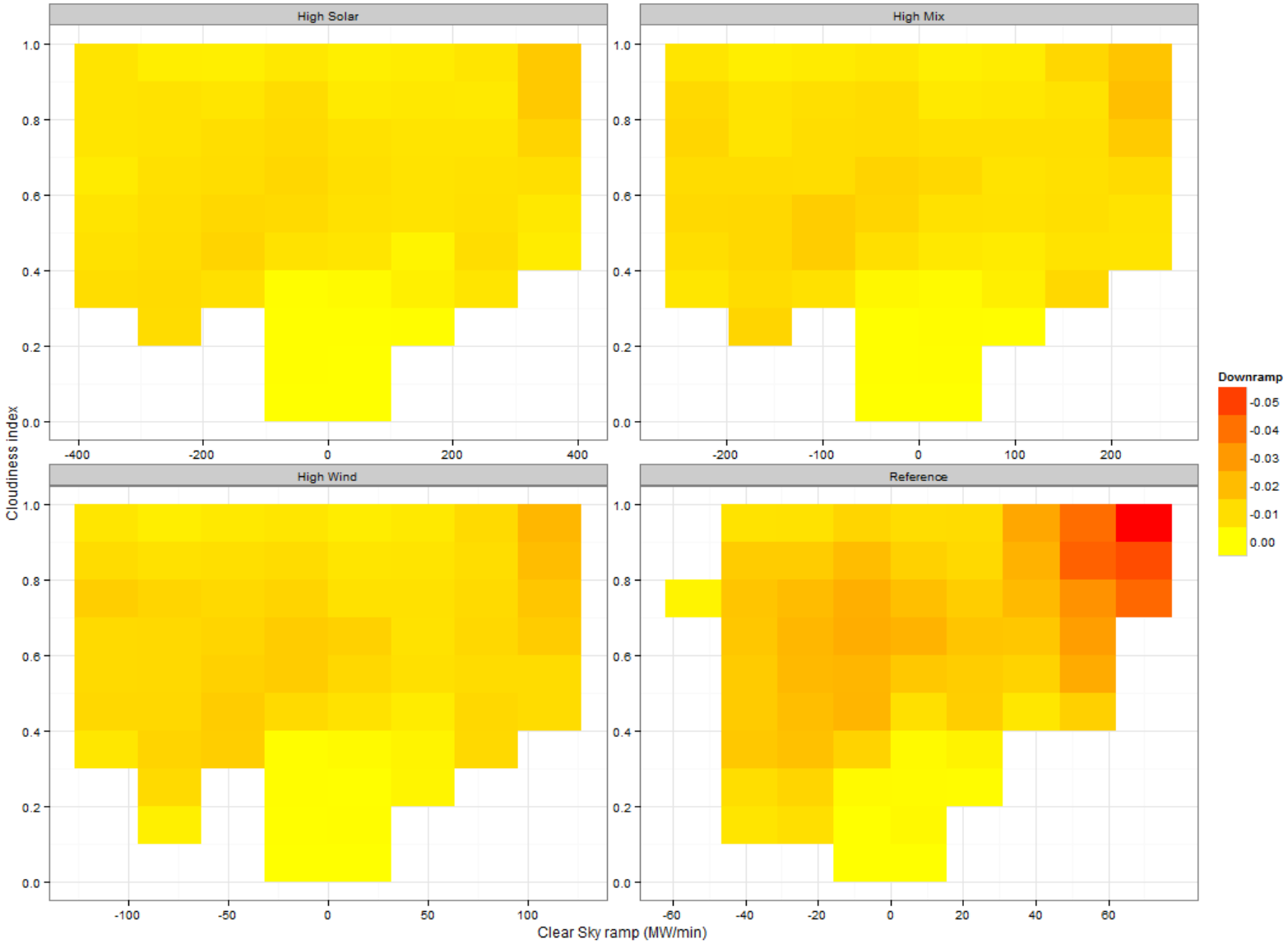
***(Persistence of cloudiness index)***



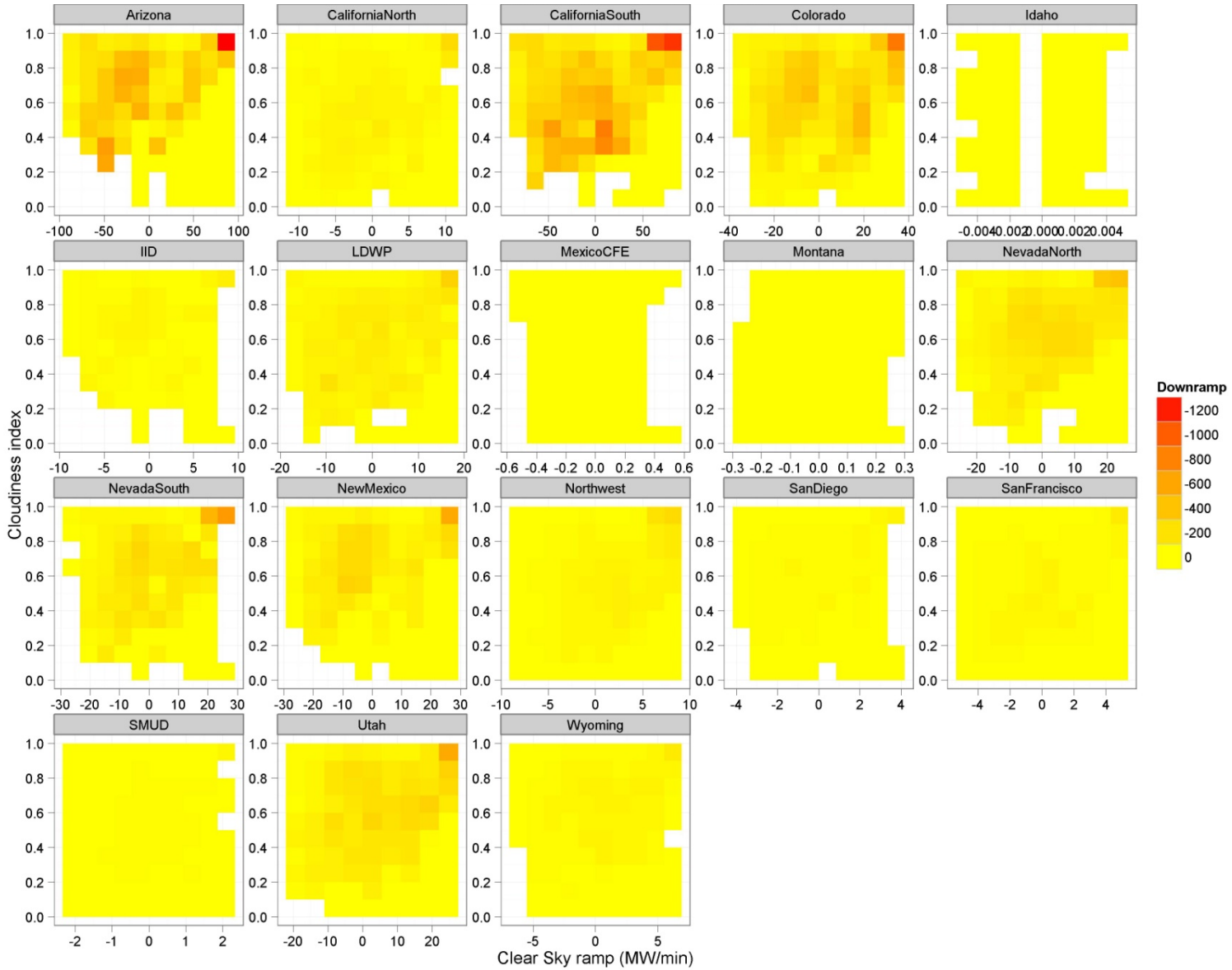
# Solar regulation reserves



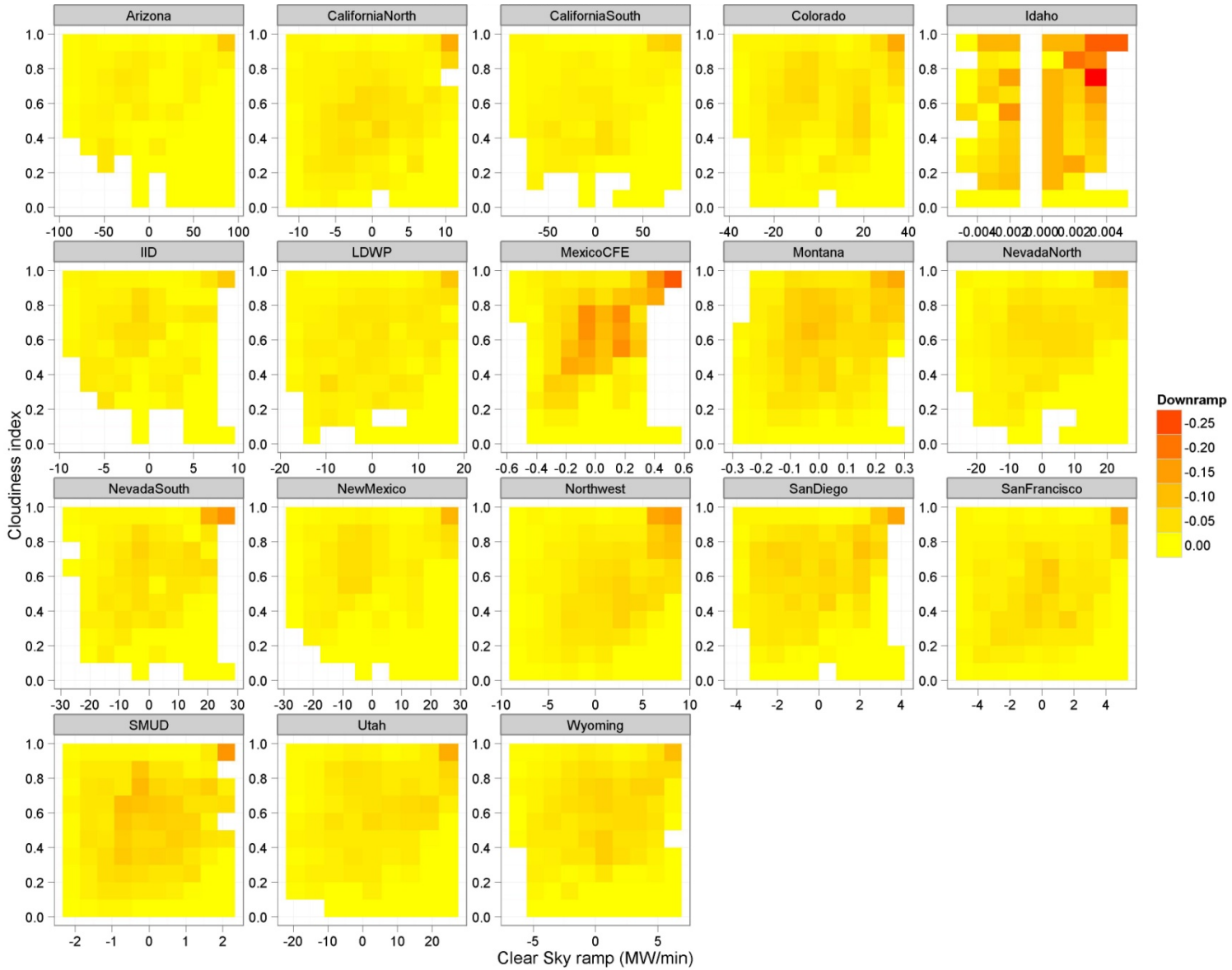
# Solar reg. relative to installed capacity



# Solar flex reserves for High Solar



# … and relative to installed capacity



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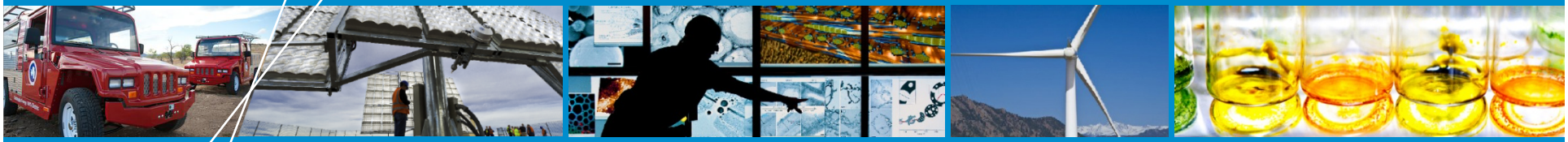
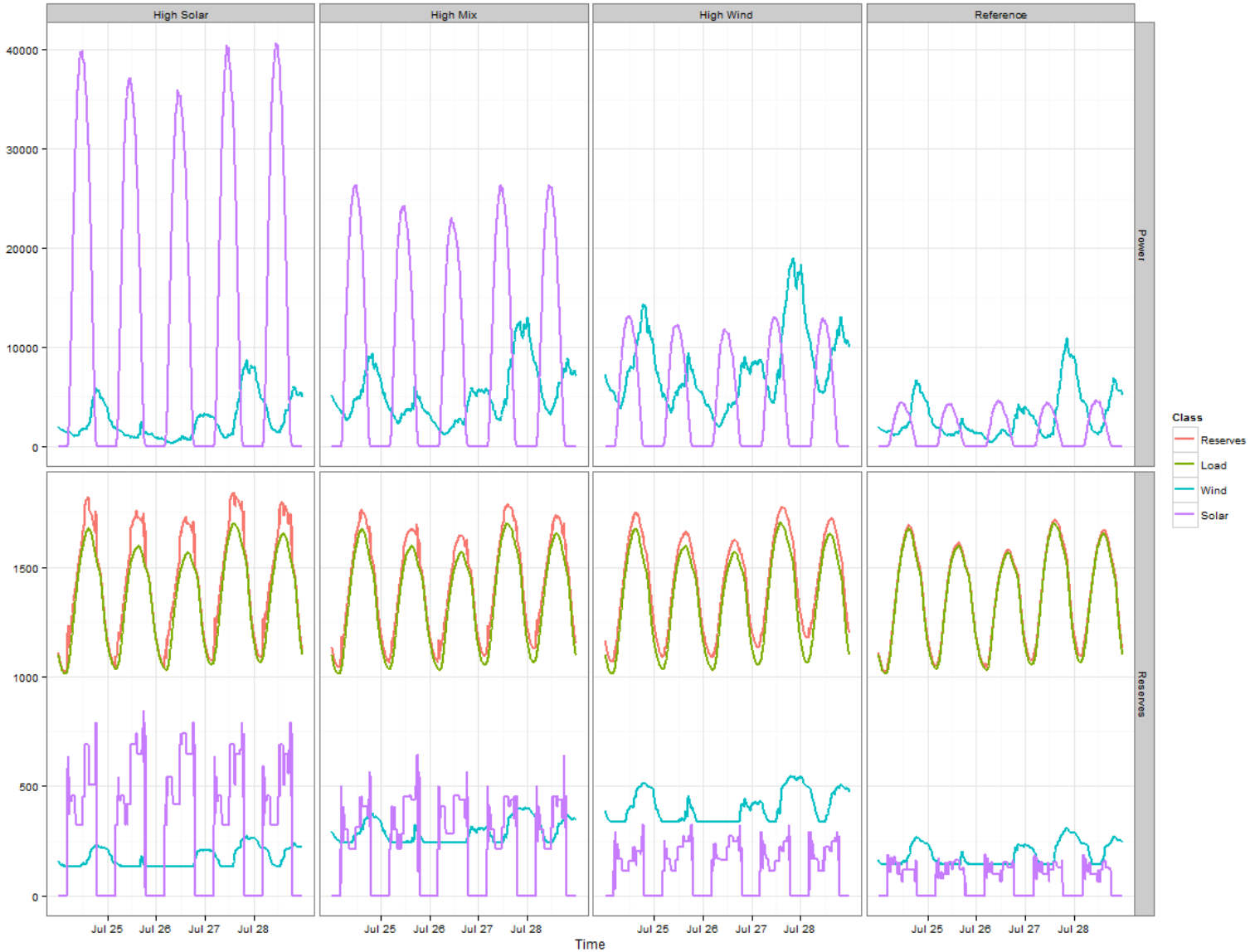
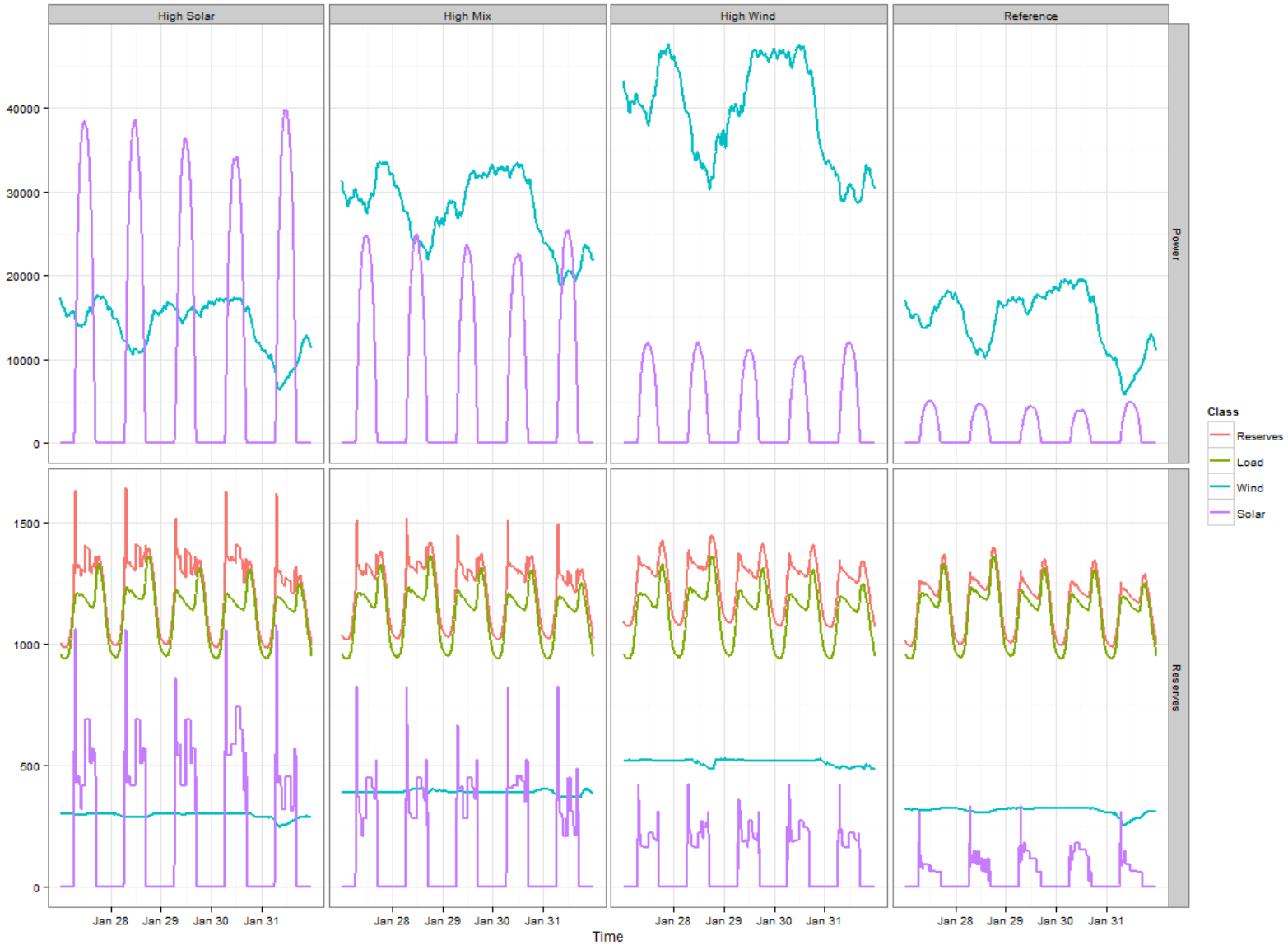


# Time series

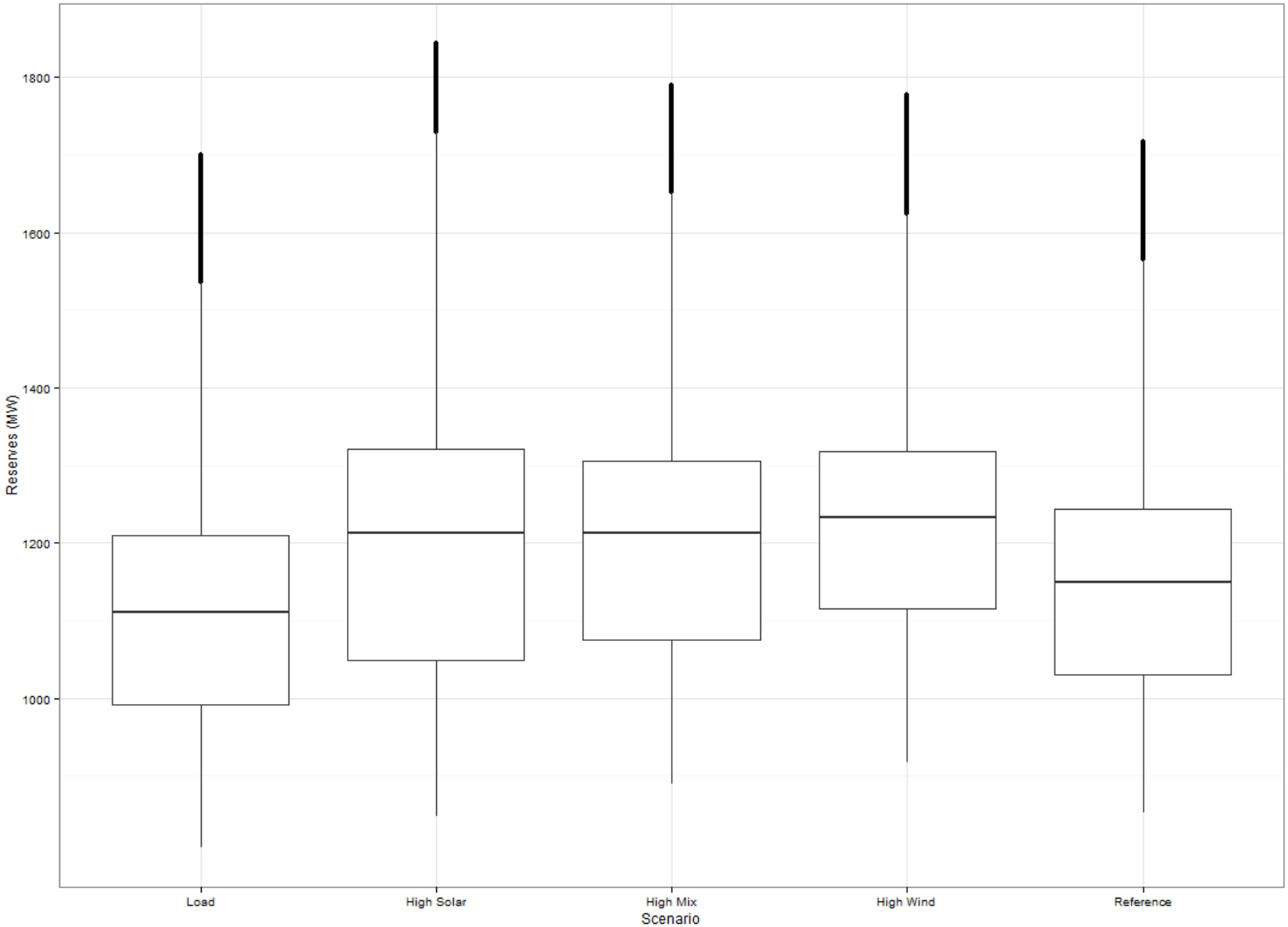
# Regulation reserves in July (highest)



# Regulation reserves in January



# Regulation reserve distributions



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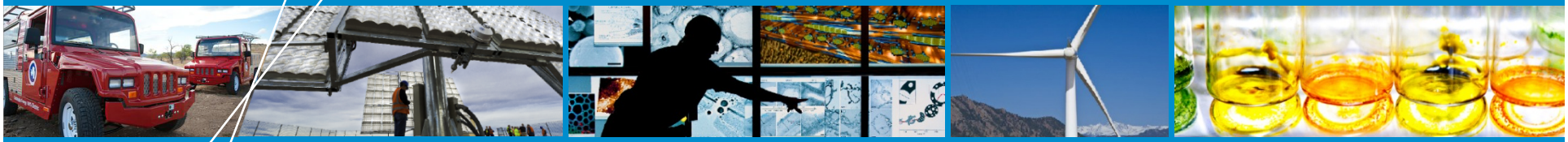

# Next steps

# Next steps

- **Figure out why PLEXOS results look weird and correct**
- **Finalize inputs**
- **Run core scenarios**
- **TRC call in July?**
  - Discuss core scenario results (possibly just one or two of them)

# Questions?


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