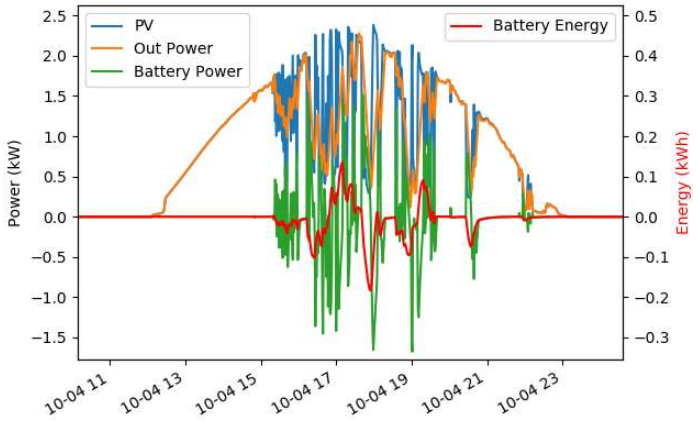
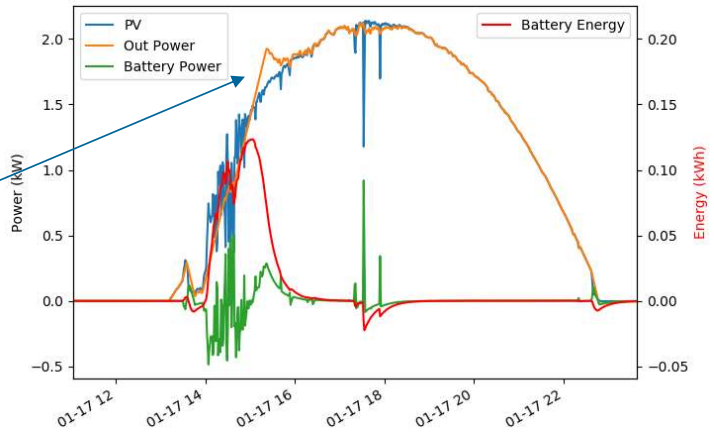
Controller Design

- Primary Objective: output power to track PV power without exceeding ramp rate
  - Secondary Objective: return battery to the resting state of charge (SOC)
- Based on PI (proportional plus integral) controller
  - Output power = Output power previous + min(error term, max step)
  - Error term = instantaneous power error (proportional) + accumulated SOC error (integral)
  - Two error terms have weights:
    - Kp = how aggressive to follow (if greater than 1, can even jump ahead)
    - Ki = how aggressive to return battery to resting SOC
  - Resting SOC is initially set to 50%
- Boundaries (violations occur when these are encountered):
    - Battery SOC boundaries: 0 and 100%
    - 0 ≤ Output Power (PV+Battery) ≤ Nameplate AC * 1.05

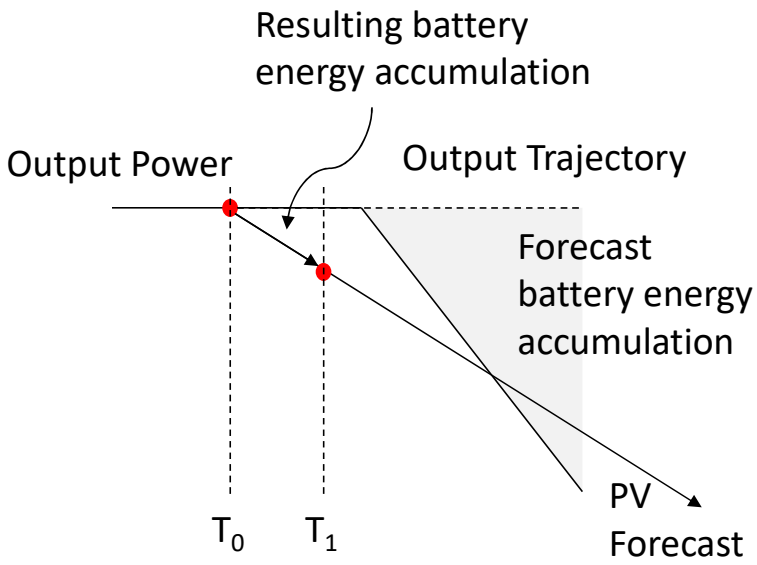




Output “overshoots” PV power to release charge from battery

Forecasting Controller

- Begin ramping output before PV power actually ramps
  - Will's example pictured
- Controller implementation:
  - Error term = instantaneous power error (proportional) + accumulated SOC error (integral) + **forecast accumulated error**
  - Begin to ramp before PV ramps (in same direction)
  - One additional control parameter: Kf*(forecast accumulation error)
    - Forecast accumulation error = ∫(Output Trajectory-PV Forecast)



Begin down-ramp to avoid future energy accumulation