



# Peak-Shaving Theater Lighting

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Figure 1: Lorain Palace Theater.

## Problem

- Lorain Palace Theatre has an extraordinarily high electricity bill.
- Consumes most power during specific times.
- Leads to high peak power demands.
  - Power companies charge for peak load demand.
  - Significantly increases power bill.
- System can be designed to lower the peak load demand.

## Design

- Battery backup system used to shave the peak load demand.
- Takes power from low demand hours and supplies it during high peak load hours.
- Key components for the system.
  - Inverter
  - Battery Storage
  - Battery Control System
- Solar Energy can be used to Charge the Batteries.

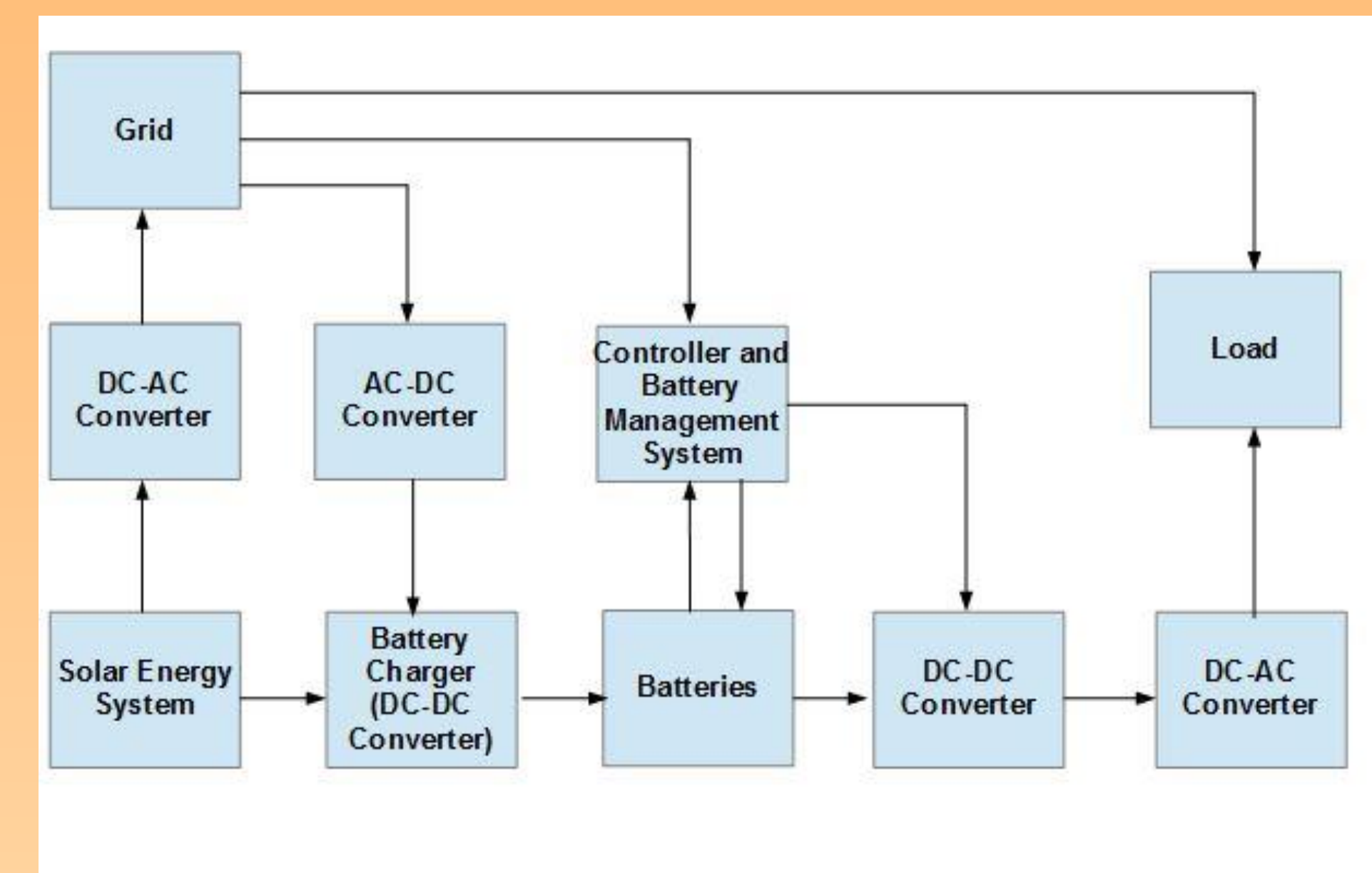


Figure 3: Top level schematic of a system that includes solar cells and a battery backup system.

## Results

- Lower load consumption demands.
  - Change lights to LEDs.
- Replace old inefficient loads.
  - AC Unit, Air Compressor.
- Peak shaving for high demand hours.
  - Helps even out peak load demand.
  - Have to design system to implement.

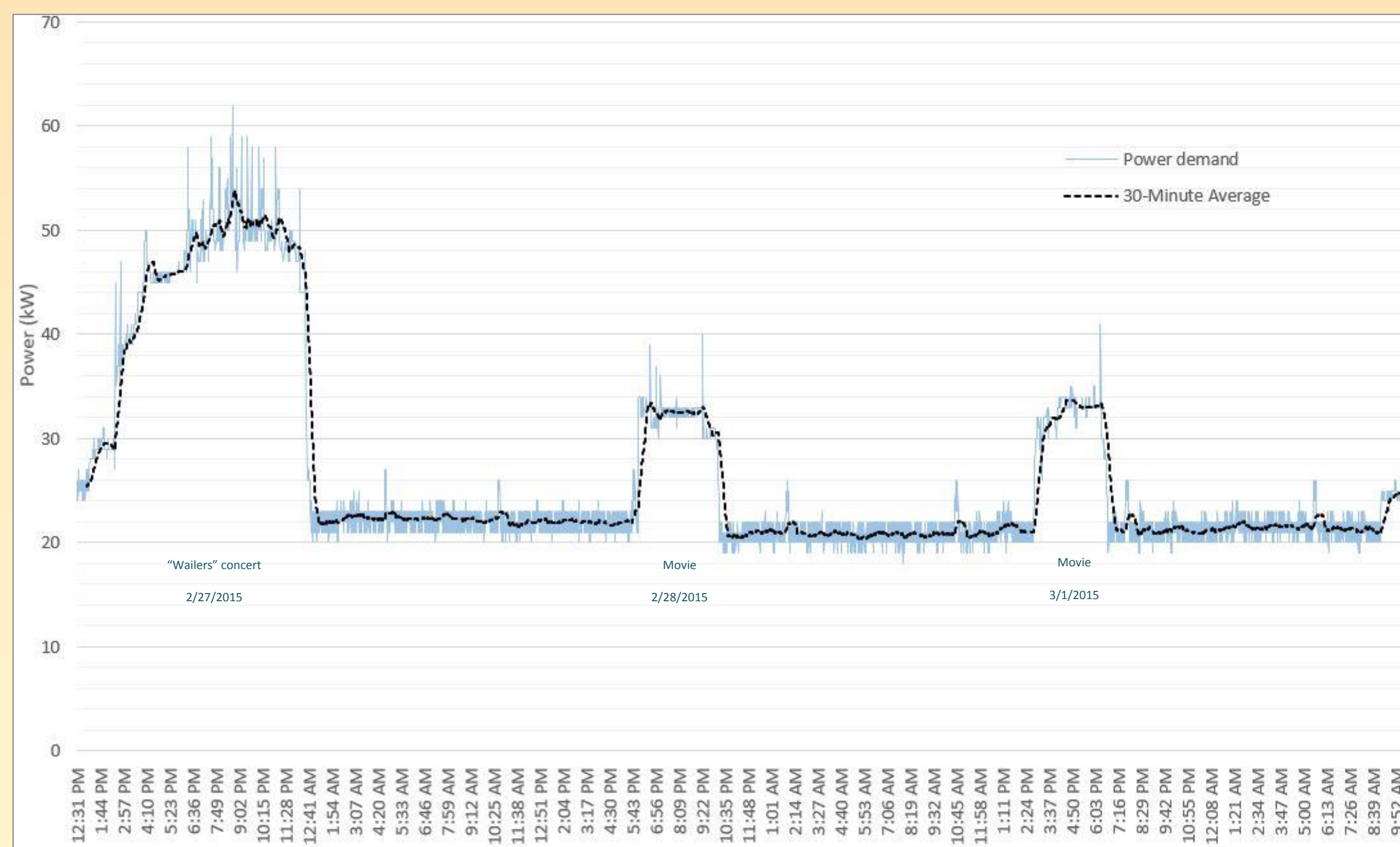


Figure 2: Instantaneous power demand and 30-minute average power during a four day period,

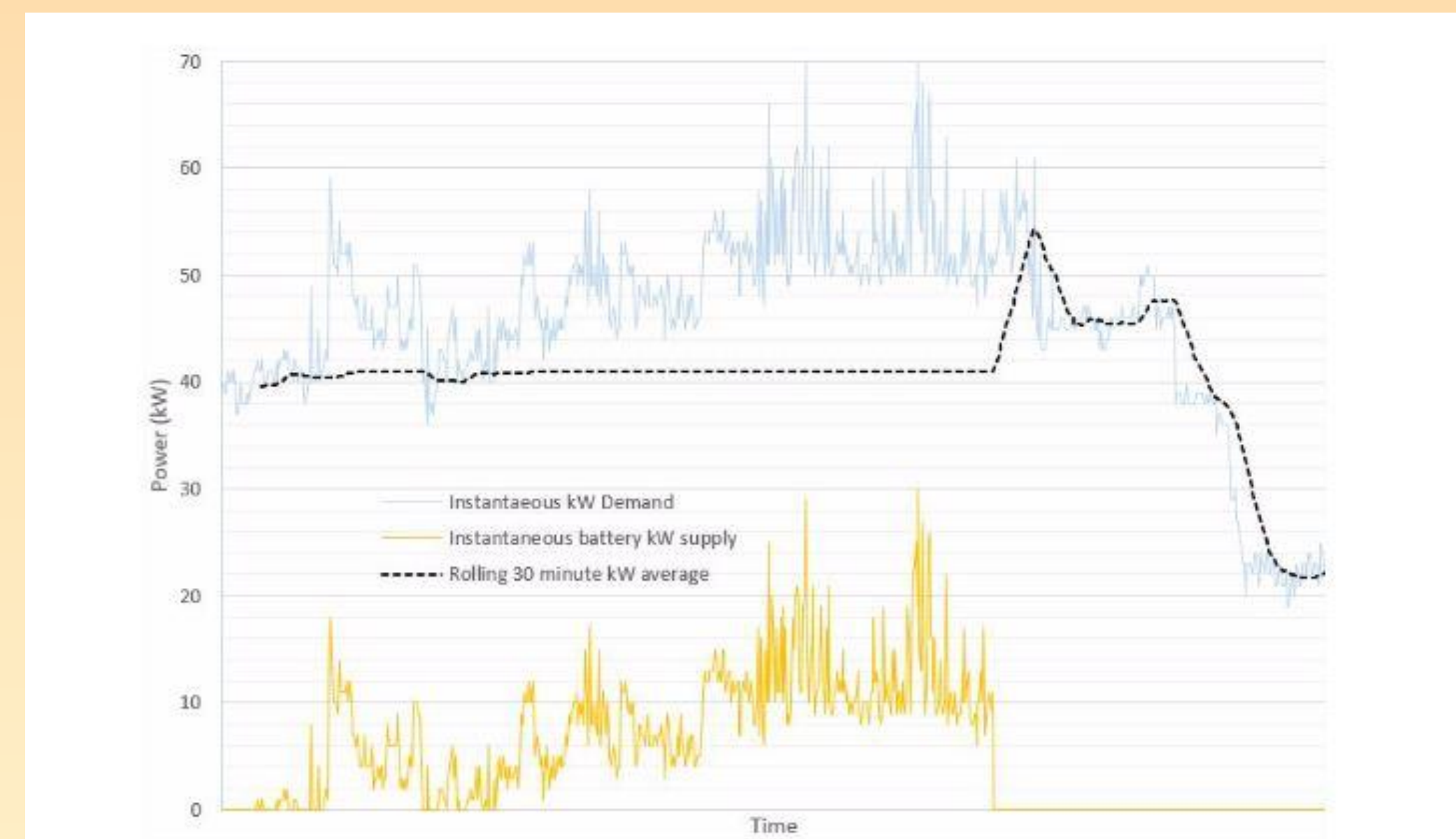


Figure 4: Data taken from the theatre during a concert. This includes a simulated battery-supplied power (41kW threshold with 80 batteries) and a 30-minute kW average from the grid.