EV CHARING SLOT RESERVATION & LOAD MANAGEMENT

UAT Test Case

1. Slot Reservation Module:

UAT-01: Search Stations

Objective: Verify user can search nearby charging stations
Precondition: User logged in, Home screen open
Steps:

1. Open the app

2. Enter location or allow GPS

3. Click Search
   Expected Result: System shows stations within 10 km radius

UAT-02: Filter Stations

Objective: Verify filter options work
Precondition: Station list loaded
Steps:

1. Open filters

2. Select Fast Charger

3. Apply filter
   Expected Result: Only fast charger stations appear

UAT-03: View Time Slots

Objective: Verify slot availability display
Precondition: Station selected
Steps:

1. Select station

2. Navigate to slot screen
   Expected Result: Available, reserved, blocked slots display with color codes

UAT-04: Book a Slot

Objective: Verify slot booking
Precondition: User logged in, slot available
Steps:

1. Select time slot

2. Confirm booking

3. View confirmation
   Expected Result: Slot is booked and confirmation ID generated

UAT-05: Cancel a Booking

Objective: Verify user can cancel a booking
Precondition: Active booking exists
Steps:

1. Open Booking

2. Click Cancel

3. Confirm
   Expected Result: Booking is cancelled and slot freed

UAT-06: Auto-Expire Booking

Objective: Verify no-show logic
Precondition: User has a booking
Steps:

1. Do not check-in

2. Wait 10 minutes after slot time
   Expected Result: Booking auto-expires

2. Charger Monitoring Module:

UAT-07: Real-Time Status Update

Objective: Check charger status refresh
Precondition: Charger is operational
Steps:

1. Open charger details

2. Wait 10 seconds
   Expected Result: Status auto-refreshes

UAT-08: Fault Detection

Objective: Check fault detection triggers
Precondition: Fault telemetry simulated
Steps:

1. Trigger high-temperature telemetry

2. Wait for system update
   Expected Result: Charger marked "Faulty" and operator alerted

UAT-09: Operator Marks Faulty

Objective: Verify manual fault marking
Precondition: Operator logged in
Steps:

1. Mark a charger as Faulty

2. Save changes
   Expected Result: Charger becomes unavailable for booking

3. Load Management Module:

UAT-10: Load Calculation

Objective: Validate station load calculation
Precondition: Multiple sessions running
Steps:

1. Observe dashboard
   Expected Result: Load updates every 5 seconds

UAT-11: Overload Handling

Objective: Verify overload rules
Precondition: Simulated overload
Steps:

1. Attempt to start new session
   Expected Result: Session delayed or blocked

UAT-12: Dynamic Load Balancing

Objective: Validate power balancing
Precondition: Multiple sessions active
Steps:

1. Start charging

2. Observe load distribution
   Expected Result: Load distributed intelligently

UAT-13: Emergency Vehicle Priority

Objective: Validate emergency override
Precondition: Emergency-tagged user
Steps:

1. Attempt to book slot
   Expected Result: System bypasses queue and load rules

4. Queue Management Module:

UAT-14: Auto Queue Add

Objective: Verify queue addition
Precondition: All slots full
Steps:

1. Try booking a slot
   Expected Result: User added to queue

UAT-15: View Queue Position

Objective: Verify queue position display
Precondition: User in queue
Steps:

1. Open queue screen
   Expected Result: Real-time queue position visible

UAT-16: Queue Notification

Objective: Verify slot-free notification
Precondition: User in queue
Steps:

1. Free a slot
   Expected Result: User gets notification and 5-minute confirmation window

5. Pricing Module:

UAT-17: View Pricing Breakdown

Objective: Validate pricing display
Precondition: Station selected
Steps:

1. Open pricing tab
   Expected Result: Correct pricing based on charger type/demand

UAT-18: Membership Discount

Objective: Validate pricing discounts
Precondition: User = Premium
Steps:

1. Select slot

2. View price
   Expected Result: Discount applied

UAT-19: Price Refresh

Objective: Validate refresh timing
Precondition: Pricing engine on
Steps:

1. Monitor price for 20 minutes
   Expected Result: Pricing refreshes at 15-minute intervals

6. Charging Session Module:

UAT-20: Start Session Automatically

Objective: Verify charging start
Precondition: User plugged in
Steps:

1. Plug vehicle

2. Wait for validation
   Expected Result: Session starts automatically

UAT-21: Track Charging Session

Objective: Verify session data
Precondition: Active session
Steps:

1. Open session page
   Expected Result: Shows time, units consumed, and cost

UAT-22: Auto Stop Session

Objective: Validate auto-stop logic
Precondition: Session running
Steps:

1. Simulate battery full
    Expected Result: Charging stops automatically

7. Notifications Module:

UAT-23: Booking Confirmation

Objective: Validate booking notification
Precondition: Booking completed
Steps:

1. Check notifications
    Expected Result: SMS/App/Email received

UAT-24: 30-Minute Reminder

Objective: Validate reminder
Precondition: Future booking exists
Steps:

1. Fast-forward system clock
    Expected Result: Reminder sent at correct time

UAT-25: Charging Complete Notification

Objective: Validate end notification
Precondition: Session ended
Steps:

1. Finish charging
    Expected Result: User notified immediately

8. Operator Dashboard Module:

UAT-26: View Dashboard Metrics

Objective: Validate dashboard
Precondition: Operator logged in
Steps:

1. Open dashboard
   Expected Result: Shows load, faults, bookings, and queue

UAT-27: Fault Alerts

Objective: Verify alerts
Precondition: Charger faulty
Steps:

1. Trigger fault
   Expected Result: Alert shown in dashboard

UAT-28: View Forecast

Objective: Validate demand forecasting
Precondition: Historical data available
Steps:

1. Open forecast tab
   Expected Result: Next-day forecast shown

9. System Reliability:

UAT-29: Notification Failure Handling

Objective: Validate retry logic
Precondition: SMS gateway down
Steps:

1. Trigger notification
   Expected Result: System retries then uses fallback (email/push)

UAT-30: System Recovery

Objective: Validate recovery from downtime
Precondition: Charger offline
Steps:

1. Simulate offline → online
   Expected Result: System updates status with no data loss