MODULE 05 FIELD EXERCISE

Assess a Building's Power and Bank Your Own

TASK: Read one building's electrical system from open sources to the panel and compute the headroom on one branch circuit. Build one battery bank from salvaged batteries and power a measured load from it to prove the runtime.

CONDITION: Given your own residence or a structure you have permission to assess, open-source tools (OpenStreetMap, Overpass Turbo, utility outage maps), a multimeter, a clamp meter, salvaged batteries (lead-acid/AGM and/or LiFePO4), fuses, holders, wire sized to the current, and a charge controller or charger. Work only in structures you have the right to assess and with batteries you have every right to take. Charge lead-acid only in a ventilated space.

STANDARD: Two products, both dated. (1) Structure assessment: the serving utility named from open sources; service type identified as overhead or underground; main disconnect rating read at the panel, or the exterior service reads (service type, meter, transformer) if the panel is inaccessible; one branch circuit's headroom computed as 80 percent of the breaker rating minus the clamp-meter reading on that circuit's existing draw; a tap point identified on that circuit (the tap itself is optional where you do not own the structure). (2) Battery bank: each battery's measured resting voltage and tested capacity under a real load; the measured load in watts (V x I = W, from your own meter); the computed-versus-observed runtime to your planned depth of discharge; the bank fused at every battery-positive branch; its charge source set to the bank's chemistry profile before connection; and the build Quiet: no generator, no exposed light, no heat or interference tell. Solar charging (Unit 10) is not required to complete this exercise.

SAFETY FIRST

A charging lead-acid battery generates hydrogen gas, explosive from 4.1 percent concentration in air: charge only in a ventilated space, and make and break every connection away from the battery posts so any spark happens away from any gas. Nothing metallic crosses the posts; rings and watches come off before the wrenches come out. A shorted block drives a heavy current through whatever bridges its posts, so every branch is fused at the battery positive. Never charge a lithium pack below freezing: charging below 0 C damages the cells and raises the risk of fire, so a cold pack warms indoors to at least 10 C for a few hours first. Electric-vehicle traction packs (200 to 800 volts) are excluded from this exercise entirely.

RESOURCES

Module 05, Units 01 and 02: the grid from open sources: OpenStreetMap, Overpass Turbo, Open Infrastructure Map, and the serving utility's outage map

Module 05, Units 03, 04, and 05: on-site reading: transformer and service type, the panel, headroom computation, and tapping a circuit

Module 05, Units 07 and 08: the sourcing bench: UPS, junkyard, scooter, and scrubber lead-acid finds, and the LiFePO4 pack tier with its own voltages

Module 04, Salvage: the survey, teardown, and test method every battery pull runs through

Power budget bench: the sizing arithmetic run on your own numbers: daily watt-hours, usable capacity, days of storage `(lightfightermanifesto.org/tg/interactives/power-budget.html)`

NREL PVWatts: your location's peak sun hours, if you extend the exercise to solar charging `(pvwatts.nrel.gov)`

Task 1 · Survey from open sources

1. Run an Overpass Turbo query for power infrastructure in your area (Unit 02). Identify the serving utility and the nearest distribution transformer to the structure.
2. Check the utility's outage map and Open Infrastructure Map for the voltage class on the primary side and the feeder serving your address.
3. Record the utility name, transformer location, and primary voltage. These are the open-source readings the on-site visit will confirm.

Task 2 · Read the structure on site

1. Identify the service type: overhead (service drop from the pole) or underground (lateral from a pad or vault). Trace the path from the transformer to the meter to the main disconnect.
2. At the panel, read the main disconnect rating in amps. Read each branch breaker's rating and its label. If the panel sits in a locked room you cannot reach, ask the property manager for access; failing that, record the exterior reads (service type, meter, transformer) and move to task 3.
3. Clamp the clamp meter around one branch circuit's hot conductor at the panel. Read the existing draw in amps while the circuit runs its normal load. Compute the headroom: 80 percent of the breaker rating minus the clamp-meter reading.
4. Identify a tap point on that circuit: a receptacle or junction box downstream of the breaker. The tap itself is optional where you do not own the structure.

Task 3 · Measure the load

1. Set the multimeter to DC amps and put it inline on the load's positive lead the way Module 02 taught, or close the clamp meter around the positive conductor.
2. Read the current while the device does its real job; a radio gets a receive reading and a transmit reading, and a device with a starting surge gets read at start and at steady state.
3. Compute watts: the measured current times the system voltage (V x I = W). Multiply by the hours a day the load runs, add a quarter for margin, and record the daily watt-hour budget.

Task 4 · Salvage and inspect the batteries

1. Source at least two batteries from the tiers Units 07 and 08 teach: a UPS pull, a junkyard block, a scooter or scrubber deep-cycle, or a LiFePO4 pack.
2. Inspect before anything connects: reject a cracked case, a bulged side, or a leaking post on sight, and identify each find as starter or deep-cycle, lead-acid or LiFePO4.
3. Read each battery's resting voltage with the multimeter. A healthy 12-volt lead-acid block at rest reads about 12.3 to 12.75 volts; a 4S LiFePO4 pack near 13.2 volts is sitting at 3.3 volts per cell. Record every reading, dated.

Task 5 · Test the true capacity

1. Charge each battery fully on a charger set to its chemistry's profile: in a ventilated space for lead-acid, and never below freezing for a lithium pack (a cold pack warms indoors to at least 10 C first).
2. Put your measured load (or a known resistive load) on one battery at a time, note the start time, and log the terminal voltage every hour.
3. Stop at your planned depth of discharge (50 percent for lead-acid planning) and compute the capacity actually delivered: the load's watts times the hours it ran. This tested figure replaces the label in every later plan.

Task 6 · Build and fuse the bank

1. Pick the system voltage and the batteries that share it: one bank, one chemistry, one age class; a lead-acid block and a LiFePO4 pack never share a bus.
2. For a parallel bank, confirm the blocks read nearly the same resting voltage before the jumper lands; the fuller block otherwise dumps current into the emptier one through the cables.
3. Fuse every branch at the battery-positive end: branch draw divided by 0.75, next standard size up, and below what the wire can carry. Land every negative on one common bus, then tug-test every joint.

Task 7 · Prove the runtime, Quiet

1. Compute the expected runtime: the bank's tested usable watt-hours divided by the load's measured watts.
2. Run the real load on the bank, log the voltage every hour, and record the observed runtime to your planned depth of discharge.
3. Check the build against the Quiet standard from outside: no generator, no exposed light from LEDs or displays, no heat tell, no interference on a radio beside the bank. Set the charge source to the bank's chemistry profile, connect it, and confirm charging. Date the completed sheet.

Task 8 · Field notes

Keep the whole record together: the open-source survey, the on-site readings, the headroom computation, and the tap point; each battery's source, chemistry, resting voltage, and tested capacity; the load's measured draw and the daily budget; the bank's wiring and fuse sizes; the computed and observed runtime with the hourly voltage log; and the charge source and its profile setting. The dated sheet is what the next run of the same bank is measured against.

Structure and bank record

This is the record of both products: what the structure's electrical system can carry, and what the bank delivered. A later assessment or bank test is measured against it.

Item	What you record	This test (date)	Next test (date)
Serving utility	Utility name and the distribution transformer serving the structure, from open sources		
Service type	Overhead or underground, traced from the transformer to the meter to the main disconnect		
Main disconnect	Rating in amps, read at the panel; the exterior reads stand in if the panel is inaccessible		
Branch circuit headroom	Breaker rating, clamp-meter reading of existing draw, computed headroom (80% of breaker minus draw)		
Tap point	The receptacle or junction box identified on the measured circuit (optional if not your structure)		
Battery 1, measured voltage	Source and chemistry, and the resting voltage read before anything connects		
Battery 1, tested capacity	The watt-hours actually delivered under the timed load, to the planned depth of discharge		
Battery 2, measured voltage	Source and chemistry, and the resting voltage read before anything connects		
Battery 2, tested capacity	The watt-hours actually delivered under the timed load, to the planned depth of discharge		
Measured load	The running draw from your own meter, V x I = W, with the daily watt-hour budget		
Runtime, computed vs observed	Usable watt-hours divided by load watts, against the runtime the log actually shows		
Quiet check	No generator, no exposed light, no heat tell, no interference beside the bank		

Task record

One row per task. Record your result, then call it pass or fail against the expected result.

#	Task	Setting	Expected	Your Result	Pass / Fail
1	Open-source survey	`Overpass Turbo, outage map`	utility named transformer located primary voltage recorded		
2	On-site reading	`Panel, clamp meter`	service type identified main disconnect rating headroom computed tap point identified		
3	Measure the load	`Meter inline`	running draw in W daily budget in Wh		
4	Inspect + resting voltage	`Multimeter, DC volts`	chemistry and build identified resting voltage recorded		
5	Capacity test	`Timed load`	tested Wh per battery hourly voltage log		
6	Build the bank	`Fused branches`	voltages matched every branch fused		
7	Runtime + Quiet	`Real load`	computed vs observed runtime Quiet confirmed		