

# Checklist for Electrical System Design and Installation

---

## 1. Conceptual Design

### a. Identify Client Needs

- Determine the purpose of the system (domestic or industrial).
- Assess energy consumption patterns and peak demand.
- Understand site-specific conditions (location, climate, shading obstacles).

### b. Preliminary System Sizing

- Estimate the total energy requirements (kWh/day).
- Calculate the required capacity of solar panels and batteries.

### c. Select System Components

- **Solar Panels**
  - Choose panel type (monocrystalline, polycrystalline, thin-film).
  - Determine the number and wattage of panels needed.
- **Inverters**
  - Select appropriate inverter type (string, micro, hybrid).
  - Ensure compatibility with panel output and grid requirements.
- **Batteries**
  - Decide on battery type (lithium-ion, lead-acid).
  - Calculate storage capacity based on energy needs.
- **Charge Controllers**
  - Choose between MPPT or PWM controllers.
  - Ensure they match the system voltage and current.
- **Additional Devices**
  - Consider backup generators, monitoring systems, and safety disconnects.

### d. Feasibility and Budgeting

- Estimate initial costs and operational savings.
- Analyze return on investment (ROI) and payback period.
- Explore financing options and available incentives or rebates.

### e. Sales Proposal Development

- Prepare a proposal highlighting system benefits.
  - Include visual aids like conceptual diagrams and site layouts.
  - Outline estimated costs and timelines.
-

## 2. Basic Design

### a. Compatibility Check

- Verify that all selected components are electrically compatible.
- Ensure voltage and current ratings align across devices.

### b. Detailed System Sizing

- Refine calculations for panel array size and orientation.
- Adjust battery capacity based on detailed load analysis.
- Confirm inverter capacity matches total system output.

### c. Physical Layout Planning

- Plan the physical arrangement of panels, inverters, and batteries.
- Consider roof space, tilt angles, and shading for panel placement.
- Ensure adequate ventilation and accessibility for equipment.

### d. Regulatory Compliance

- Review local building codes and electrical standards.
- Ensure the design meets safety regulations (NEC, IEC standards).
- Plan for necessary permits and inspections.

### e. Preliminary Schematics

- Draft basic electrical diagrams showing component connections.
  - Highlight key components and their interactions.
- 

## 3. Detailed Design

### a. Create Unifilar (Single-Line) Diagrams

- Develop detailed electrical schematics.
- Illustrate all connections, including wiring sizes and protection devices.

### b. Component Specifications

- Finalize selection of all components with exact models.
- Document technical specifications and manufacturer datasheets.

### c. Protection Systems Design

- Design overcurrent protection with appropriate breakers and fuses.
- Include surge protection devices and lightning arrestors.
- Plan grounding and bonding according to standards.

### d. Auxiliary Equipment and Materials

- List all necessary cables, conduits, connectors, and mounting hardware.
- Specify cable types, lengths, and ratings.

### e. Detailed Physical Layouts

- Prepare installation drawings for all equipment.
- Indicate mounting details and space requirements.

#### **f. System Performance Analysis**

- Run simulations to predict energy production and system efficiency.
- Adjust design parameters based on analysis results.

#### **g. Documentation**

- Compile a comprehensive design report.
  - Include all calculations, diagrams, and specifications.
- 

### **4. Requirements**

#### **a. Electrical System Specifications**

- Define system performance criteria (efficiency, capacity).
- Specify operational parameters (voltage levels, frequency).

#### **b. Bill of Materials (BOM)**

- List all components and materials with quantities.
- Include part numbers, manufacturers, and suppliers.
- Optionally provide unit and total costs.

#### **c. Installation Requirements**

- Outline step-by-step installation procedures.
- Specify required tools, equipment, and safety gear.
- Detail labor skills and manpower needed.

#### **d. Compliance and Certifications**

- Prepare documentation for electrical permits.
- Ensure all components meet regulatory certifications (UL, CE).

#### **e. Project Schedule**

- Develop a timeline for procurement, installation, and commissioning.
- Allocate time for inspections and testing.

#### **f. Maintenance and Operation Manuals**

- Provide guidelines for system operation.
  - Include maintenance schedules and troubleshooting tips.
- 

### **5. Installation**

#### **a. Pre-Installation Planning**

- Confirm delivery dates for all components.
- Coordinate with suppliers and contractors.
- Verify site readiness and access arrangements.

#### **b. Safety Measures**

- Implement safety protocols for installation crew.

- Conduct risk assessments and toolbox talks.

#### **c. Installation Execution**

- **Solar Panels**

- Install mounting structures securely.
- Mount panels at correct angles and orientations.

- **Inverters and Batteries**

- Install inverters in ventilated areas.
- Place batteries in secure, temperature-controlled environments.

- **Wiring and Connections**

- Route cables neatly and securely.
- Ensure proper labeling of all connections.

#### **d. System Integration**

- Connect components as per the unifilar diagram.
- Install protection devices and ensure grounding.

#### **e. Quality Control Checks**

- Inspect all installations against design specifications.
- Test electrical connections for continuity and insulation resistance.

#### **f. Commissioning**

- Power up the system following manufacturer guidelines.
- Monitor system performance and verify against expected parameters.
- Calibrate monitoring and control systems.

#### **g. Final Inspections**

- Arrange for inspections by regulatory authorities.
- Obtain necessary certifications and approvals.

#### **h. Client Training and Handover**

- Provide training on system operation and safety.
- Deliver all documentation, including warranties and manuals.
- Offer guidance on monitoring and maintenance.

#### **i. Post-Installation Support**

- Schedule follow-up visits to assess system performance.
- Provide contact information for technical support.