# System Design Guides

**A solar system is only as good as its design. At Phoenix Grid Solutions Ltd, every installation starts with a structured design process that protects performance, safety, and long term value. Below is our design approach and the key principles we apply on every project.**

**1) Load Assessment and Energy Audit**

**We begin by understanding what you need to power and for how long. This includes:**

- **Appliance inventory and ratings (running watts and start up surge)**
- **Usage pattern mapping (daytime vs night time, weekdays vs weekends)**
- **Daily energy consumption estimation in kWh**
- **Identification of critical loads vs non critical loads**

**Outcome: an accurate demand profile that prevents under sizing and unnecessary overspend.**

**2) System Sizing Principles**

**We size the system based on your energy profile, site conditions, and desired autonomy.**

- **PV array sizing to meet daytime loads and recharge batteries**
- **Inverter sizing to handle peak demand and motor surges**
- **Battery sizing to meet night time loads and backup duration targets**
- **Allowance for growth so the system can scale without redesign**

**Outcome: a balanced, scalable system that matches real world usage.**

**3) Battery Strategy and Backup Autonomy**

**Battery design is driven by what must stay on during outages.**

- **Backup hours and depth of discharge planning**
- **Battery chemistry selection (typically LiFePO4 for durability and safety)**

- **Charge and discharge rate checks to protect battery life**
- **Future expansion planning for additional storage**

**Outcome: predictable backup performance and longer battery lifespan.**

**4) PV Layout and Site Suitability**

**We design for generation efficiency and structural safety.**

- **Roof or ground mounting assessment**
- **Orientation and tilt optimisation**
- **Shading analysis and mitigation**
- **Wind loading and mounting integrity checks**
- **Cable routing for clean, low loss installation**

**Outcome: maximum energy harvest and a tidy, maintainable layout.**

**5) Electrical Protection and Safety Controls**

**Safety is designed in, not added later.**

- **DC and AC isolators and proper earthing**
- **Surge protection devices (SPD) for lightning and grid events**
- **Correct cable sizing and voltage drop control**
- **String fusing and breaker coordination**
- **Safe changeover design for hybrid or backup systems**

**Outcome: compliant protection that reduces fire risk and equipment damage.**

**6) Hybrid and Generator Integration**

**Where required, we integrate grid and generator support without compromising the solar system.**

- **Hybrid operating modes designed around your priorities**
- **Generator auto start logic (where applicable)**
- **Anti back feed protection and correct changeover design**
- **Priority loads separation for stable operation**

**Outcome: seamless power continuity and efficient fuel reduction.**

**7) Performance Monitoring and Maintainability**

**We design systems to be supported long term.**

- **Monitoring configuration for production, battery health, and alarms**
- **Access planning for maintenance and cleaning**
- **Labelling and documentation for future troubleshooting**
- **Preventive maintenance schedule recommendations**

**Outcome: visibility, faster fault resolution, and lower lifecycle cost.**

**8) Deliverables You Can Expect**

**For each project, we provide clear design documentation such as:**

- **Load schedule and sizing summary**
- **Single line diagram**
- **Equipment specification list**
- **Installation layout guidance**
- **Commissioning checklist and handover notes**

**If you want, I can also rewrite this as a shorter version for a homepage, plus a more technical version for a dedicated "Engineering Standards" page.**