Keeping the Lights On: How Solar Systems Support Essential Appliances During Power Outages

How Solar Systems Keep Essential Appliances Running When the Grid Goes Down

When the power cuts, a standard grid-tied solar system shuts off too. That surprises many homeowners who assume their panels keep working. But with the right components and a deliberate design, a solar installation can power critical appliances through an outage. The key is understanding what makes a system "backup-capable" and how to match it to your actual needs.

Why Most Solar Systems Go Offline During an Outage

A typical residential solar setup has no battery. Panels feed power into the grid during the day, and at night you draw from the grid. Safety regulations require that any grid-tied inverter disconnects from the grid when it detects a blackout. This prevents live wires from feeding back into the grid while line workers are repairing it. So without a battery and a changeover switch, your solar panels are useless when the grid is down.

The solution is a system that can isolate itself from the grid and run independently. That requires battery storage, an inverter that can handle off-grid operation, and a way to separate critical circuits from the rest of the house.

What Makes a Solar System Outage-Ready

For a solar system to keep appliances running during an outage, it needs three core elements:

- **Battery storage**, captures excess solar energy during the day for use at night or when clouds roll in. Without a battery, there is no power after the sun dips.
- **An inverter with off-grid capability**, not all inverters can form their own mini-grid. A hybrid or off-grid inverter can disconnect from the grid and create a stable island of power for your home.
- **A changeover switch or critical loads panel**, this physically separates the circuits you want backed up (lights, fridge, router, medical equipment) from the rest of the house. It prevents the inverter from trying to power the whole house, which it likely cannot.

When the grid fails, the changeover switch isolates your backup circuits. The inverter and battery form a microgrid. Solar panels continue to charge the battery during daylight hours, and

the battery supplies power when the sun is low or at night. The system runs until the battery is depleted or the grid returns.

Understanding Backup Load and Inverter Capacity

Not every appliance can run on backup power. The inverter has a maximum continuous power rating, and the battery has a limited energy capacity. You need to work out your backup load: the total wattage of the appliances you want to keep running at the same time.

Start by listing essential items. A fridge typically uses 150-300 watts, a few LED lights maybe 50 watts total, a router and modem around 20 watts, and a TV or laptop another 100 watts. Add them up. That sum must be less than the inverter's continuous rating. If your inverter can handle 3 000 watts, you have room for a small pump or a freezer too.

But capacity is not just about power; it is about energy over time. A 5 kWh battery can run a 500 watt load for about 10 hours. If you expect multi-day outages, you need either a larger battery or a way to reduce load. Many hybrid systems allow you to prioritise circuits, so the fridge runs first and the TV only when there is spare capacity.

Load Prioritisation: Making the Most of Limited Power

During a long outage, you cannot run everything. The trick is load prioritisation. Most backup-ready systems let you divide your home into essential and non-essential circuits. The essential circuits are wired into the backup panel; everything else stays on the main panel, which is dead during an outage.

Common choices for essential circuits include:

- Refrigerator and freezer
- Lights in key rooms (kitchen, bathroom, hallway)
- Security system and garage door
- Internet router and phone charger
- Medical devices such as a CPAP or nebuliser

Water pumps, geysers, air conditioners, and ovens are usually left off the backup circuit because they draw too much power. You can run them manually if the battery is full and the sun is strong, but only if the inverter has enough headroom. Some modern inverters allow you to toggle extra loads on and off via an app, giving you fine control without rewiring.

Energy Autonomy: How Long Can You Run?

Energy autonomy is the amount of time your system can supply your backup load without grid power. It depends on three factors: battery size, solar generation, and load.

On a sunny day, your panels may generate 10-15 kWh. If your battery holds 10 kWh, you can store most of that daytime energy. At night, you draw from the battery. If your backup load is 400 watts, the battery lasts about 25 hours. But if the next day is overcast, generation drops, and the battery may not fully recharge. A system designed for energy autonomy usually has a battery large enough to cover 24-48 hours of typical load, plus enough panel capacity to recharge it in a single good day.

Real-world autonomy also depends on how carefully you manage usage. You might run the fridge constantly, but only charge laptops sporadically. Some systems let you set a minimum battery reserve, so there is always power for critical items like lights or a medical device, even if you have been running heavier loads.

Practical Considerations for Installation

Designing a system that truly backs you up during outages requires upfront planning. You need to decide which circuits are critical, and that usually means running new wiring from the main panel to a separate backup panel. This is best done during installation or a major upgrade. Retrofitting a backup panel after the system is installed is possible but more expensive.

Another factor is the inverter's transfer time. When the grid fails, the inverter must detect the loss and switch to battery power. Most modern inverters do this in under 10 milliseconds, fast enough that lights do not flicker and electronics do not glitch. Cheaper inverters may take longer, causing a brief blackout before backup kicks in. If you run sensitive equipment, look for inverters with seamless transfer.

LAN Systems offers tailored residential and commercial solar solutions that include system design, solar panels, efficient inverters, installation and ongoing support. Their expertise covers the full process from load assessment to commissioning, which matters when you need a system that performs reliably during an outage. When you work with a provider that handles both the hardware and the setup, you avoid the common pitfalls of mismatched components or incomplete wiring.

Battery chemistry also matters. Lithium-ion batteries are more compact, last longer, and can be discharged deeper than lead-acid types. They cost more upfront but often work out cheaper over their lifespan because they cycle more times. Lead-acid batteries are still common in budget installations but need more space and maintenance, and they degrade faster if regularly discharged below 50%.

What to Watch Out For

Not every solar installer is experienced with backup systems. Some may sell you a standard grid-tied setup and tell you it works in an outage, which is false unless there is a battery and a changeover mechanism. Always confirm that the inverter you are getting has off-grid capability. Look for terms like "hybrid inverter" or "multi-mode inverter." Ask how the system handles a blackout: does it switch automatically? Can it run without the grid?

Another trap is undersizing the battery. A small battery may power your lights for a few hours, but if you want to keep a fridge running overnight, you need several kilowatt-hours. A good rule of thumb is to size the battery for at least the longest typical outage in your area, plus some margin.

Finally, watch out for systems that require internet connectivity to function during an outage. Some inverters rely on cloud services for monitoring or even for switching modes. If your internet goes down with the power, you may lose control. Choose an inverter that can operate fully locally, with manual overrides.

The Bottom Line

A well-designed solar system can keep essential appliances running through most outages. The key components are battery storage, an off-grid-capable inverter, and a dedicated backup circuit. With proper load prioritisation and realistic expectations about energy autonomy, you can maintain refrigeration, lighting, communication, and medical devices even when the grid is down for days.

LAN Systems can help you evaluate your backup load and design a system that matches your needs. Their experience with both residential and commercial installations means they understand the trade-offs between cost, capacity, and convenience. Whether you need a small backup for a home office or a larger system for a whole house, the principle remains the same: plan for the loads that matter most, and let the rest wait.