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# Electric Fencing: How to Select and Install an Energizer

*Authored by Matt Booher, Virginia Tech and Natural Resources Conservation Service Partnership, School of Plant and Environmental Sciences*

## Introduction

Proper selection and installation of an energizer is a critical component of a properly operating electric fence. This publication, one of a series on Electric Fencing, guides the reader through how to size and select an energizer to fit their operation, as well as how to place and install an energizer within the electric fence system.

## How to select an energizer

Unfortunately, no standard rating exists that would enable consumers to accurately compare energizers across companies. Some companies rate energizers based on miles of fence they will energize, but this is subjective and depends on factors such as soil type, vegetation load, and how well electrical resistance has been minimized during the construction of the fence system. Stored joules and output joules are often listed on energizers. Stored joules indicate the energy that is stored in the energizer's capacitor before its discharge into the transformer. The energy delivered by the transformer is measured as output joules, and it will always be less than stored joules. Transformers vary in their efficiency, so while stored joules may be useful for comparing energizers within a brand, the number is not very meaningful for comparing across companies. The best way to compare energizers is probably by looking at output joules. Because of widely varied conditions such as soil type, climate, vegetative load, and fence construction, it is difficult to say exactly how many output joules are needed to serve a certain number of acres or miles of fence. A good guideline is probably **one output joule per mile of fence**. Notably, as long as all hot wires are connected at the beginning and end of each fence run, installing multiple wires on a fence does not require more joules. In fact, multiple connected wires reduces resistance and improves energizer function. Another important thing to know is that the size of a fence's grounding system will be determined in large part by how many joules the energizer puts out: more joules requires more ground rods. More information can be found in in another publication in this series, "Electric Fencing: How to Install a Grounding System" (SPES-691P).

Since electric fencing is a psychological barrier, it is essential to keep a minimum voltage on the fence at all times, ideally 5,000 volts for cattle and 7,000 for sheep. One of the biggest mistakes made is using an underpowered energizer. Installing more wire than what the output Joule "rule of thumb" suggests can lead to more induction and other losses than what the energizer can overcome, resulting in voltage below the desired threshold. The longer the fence, the more losses can be expected. Every fencing situation is different so there is some level of guesswork involved in determining an appropriate sized energizer. The output joule method is currently the best method to match the energizer to the fence needs, based on anticipated losses over the span of a fence. Because of this it's often beneficial to buy a larger energizer than what is currently needed. An additional benefit is that more fence can be added later without any loss of performance.

Several types of energizers are available. "Mains" or plug-in energizers use utility electric power and are the most cost-effective based on the price per output joule (fig. 1). They are commonly available up to 30 output joules. They use relatively little electricity and usually require little maintenance if installed correctly.


Figure 1. A mains (plug-in) energizer. Image source: Matt Booher.

Many energizers are advertised as "low impedance." Early energizers were often high impedance — also known as brush or weed burners — and would burn through vegetation that encountered the fence. They were generally not as safe as modern low impedance energizers and were known to cause fires. Virtually all fence energizers on the market now are low impedance.

## Solar energizers

Solar energizers are portable energizers that rely on a gel or lithium battery to supply power (fig. 2). This battery is recharged by a solar panel. Most solar energizers provide less than 1 output joule, though larger ones (up to about 2 output joules) are available. Solar energizers are typically a best fit for areas where electric service is not available. They are commonly used with temporary fencing because of their portability.

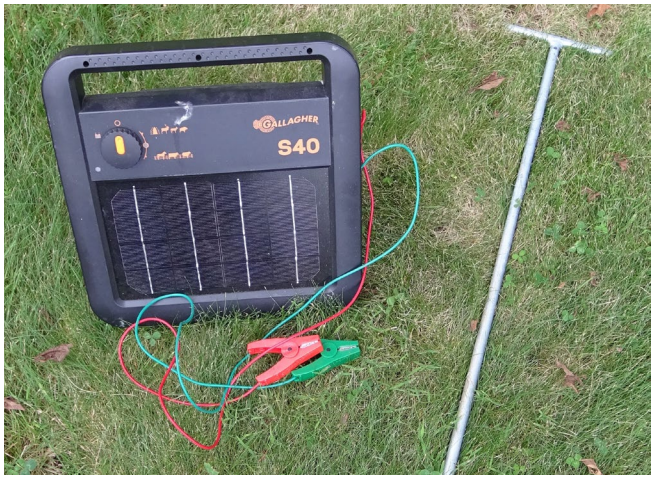


**Figure 2.** A 0.26 joule solar-type energizer. Image source: Matt Booher.

The increased availability of solar panels is quickly making energizers that use only a deep-cycle (marine) battery obsolete. With that type of energizer, the battery must be recharged relatively frequently, which often means purchasing a second battery to use while the first one is recharging. Batteries that are allowed to discharge below 50% charge, or less than 11.6 volts, will have a greatly reduced lifespan. For large fence projects that don't have a good electric source available, deep-cycle batteries can be connected to matched-size solar panels. These are used a lot for permanent fence systems where electrical service is not available. If components are correctly matched, it makes a very effective and low maintenance system, though relatively expensive.

# How to install an energizer

For most energizers, 12.5 gauge, galvanized insulated lead-out wire can be used to connect the energizer to the fence. The insulated wire will eliminate any shorts or leaked voltage. Large energizers may benefit from high-conductive aluminum-coated insulated lead-out cable, which is three times as conductive as galvanized wire. Make sure the wire is connected tightly to the positive terminal on the energizer. **Never use residential electric wire.** Twelve-gauge Romex cable, for example, is only rated to carry 600 volts, far less than what an energizer produces. Use a galvanized or stainless electric fence wire clamp or split-bolt connector (fig. 3) to connect the lead-out cable to the fence.

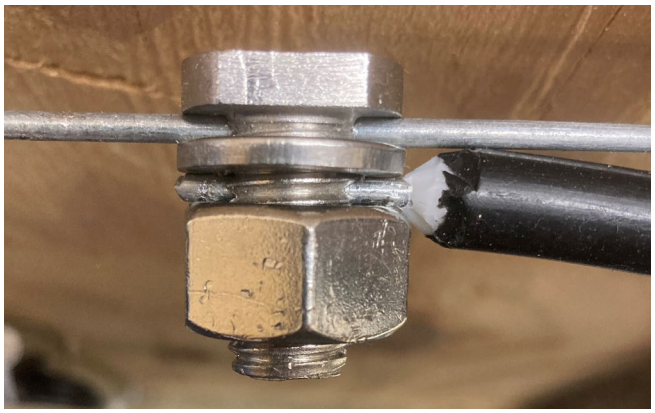

**Figure 3.** Insulated lead-out cable attached to fence with a split-bolt connector. Image source: Matt Booher.

Avoid running lead-out wire (or fence lines) parallel with telephone or power wires, particularly if they are directly overhead. Doing so may induce voltage from the power line onto your fence or may cause your energizer to interfere with landline telephone signals (heard as clicks on the phone line). The negative, or ground terminal, of the energizer should be connected to the energizer grounding system using 12 ½ gauge high-tensile fence wire or insulated lead-out wire, especially

if running through a building. See the related publication in this series, “Electric Fencing: How to Install a Grounding System (SPES-691P),” for more detailed instructions.

As you are building your fence and installing the energizer, it is a good idea to think about places in the fencing system where cut-out switches would be helpful (fig. 4). Cut-out switches simply provide the option to disconnect electricity from part of the fence system, which can aid in troubleshooting fence problems or facilitating fence repairs without turning off the power on the entire system. Some producers use cut-out switches to seasonally turn off electricity to the lowest fence wire(s) that tend to draw down fence voltage when under a heavy grass load. These switches are often installed at the entrance to the field or section of the farm they control. Depending on where your energizer is located, you may choose to install multiple cut-off switches right at the energizer to provide centralized control over the entire farm.

**Figure 4.** A cut-out switch providing an option to disconnect electricity to part of the fence system. Image source: Matt Booher.

**Never install more than one energizer on a fence.** Doing so will eventually damage the energizers. In addition, the pulses can overlap, removing the safety of a pulsed current. Also for this reason, you should never build a fence as a continuous loop (connected with no end point).

# Where to place your energizer

When deciding where to place your energizer, find or construct a sheltered location, ideally more than 33 feet away from utility or residential grounding systems. Energizers placed too close to utility or residential grounding can have issues with lightning damage because the fence grounding system often represents a better ground. Consider a shelter constructed in the field, which allows close proximity to the fence, avoids metal buildings, and provides plenty of room for the grounding system (fig. 5).


**Figure 5.** An energizer housed in a constructed shelter in the field. Image source: Matt Booher.

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