



# E<sup>3</sup>A: Micro-hydropower for the Home, Farm or Ranch

## Steps in the Micro-hydro Series

Understanding Micro-hydro

Site Assessment

Equipment and Installer Selection and Costs

Regulations

### Introduction

Growing interest in renewable energy systems — from small wind to solar — has led to a renewed interest in one of the oldest and most established renewable energy sources: hydroelectric power. When most people think of hydroelectric power, they imagine the Hoover Dam or other large-scale installations, but hydroelectricity also works on a much smaller scale. This module focuses on micro-hydroelectric systems designed for homeowners and agricultural operations to reduce use of utility-provided electricity, much like a small wind or solar electric system.



Photo credit: DOE NREL

### **Do you have access to flowing water on your property?**

The minimum required total head, or vertical drop, for a micro-hydropower system is 3 feet, but a high volume of water flow or a head of at least 10 feet is generally necessary for a viable system.

- Yes — Move to the next question.
- No — Consider other renewable energy technologies such as wind energy or photovoltaics for your property. If you are unsure about how much head your resource has, consult the *Site Assessment* guide.
- Uncertain — Read on to learn more.

### **Does the water resource have adequate flow?**

Low and seasonal flows, such as irrigation, can be used, but the greater the flow the better.

- Yes — Move to the next question.
- No — Consult the *Site Assessment* guide for a better estimate of your resources. If your water source is not conducive to a hydroelectric system, consider other renewable energy sources.
- Uncertain — Read on to learn more.

### **Do you have the legal right to use the water?**

Missouri laws combine the concept of comparative reasonable use and the riparian doctrine. Comparative reasonable use allows landowners to use as much water as needed for beneficial uses but is determined on a case-by-case basis. The riparian doctrine states “entitlements of riparian ownership fall to those who own property along the watercourse.” Put more simply, landowners whose property borders a body of water are entitled to use that water. A landowner cannot divert water from a watercourse unless they return it to the watercourse before it reaches the land of those downstream. However, the law is usufructuary, which means landowners do not own the water; they only have the right to use it. Any individual using more than 100,000 gallons of water per day is required to register with the Missouri Department of Natural Resources.

- Yes — Move to the next question.
- No — You may still be able to proceed, but you will need to consult your state engineer’s office about obtaining a non-consumptive use permit.
- Uncertain — Read on to learn more.

**Do you have an electric load within one mile of the resource?**

Closer proximity of the electric load, such as a home or irrigation system, to the hydroelectric resource lowers the cost and increases the efficiency of the hydroelectric system.

- Yes — Move to the next question.
- No — You still may be able to proceed, but you will need to more closely evaluate economic feasibility.
- Uncertain — Read on to learn more.

**Are you willing to invest money and some maintenance time into a system to generate electricity for your home, farm or ranch?**

Although many micro-hydro systems may present an attractive financial return, especially when they use existing infrastructure such as irrigation civil works, micro-hydropower receives relatively few financial incentives and does require some maintenance.

- Yes — Consult the next guide, *Understanding Micro-hydro*, to learn more.
- No — Consider lower cost projects such as energy efficiency improvements.
- Uncertain — Consult the other guides in this series to learn whether a hydropower system might be a good fit for your situation.

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